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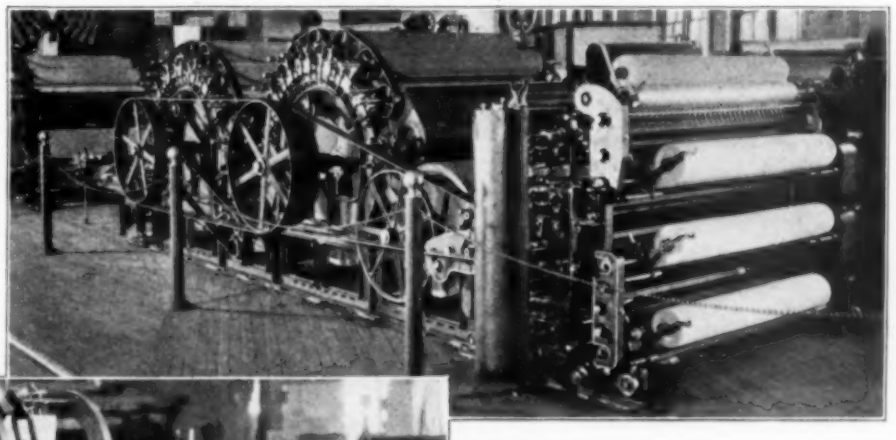
Making Textile Machine Parts

Complicated Parts Are Made of Gray Iron and Malleable Castings and Offer Interesting Problems to Foundrymen — Find Application for Roll Tamp and Special Stripping Machines

BY HERBERT R. SIMONDS

MECHANICAL ingenuity involved in the manufacture of clothing seldom is appreciated by those buying the finished material. Machines, uncanny in their lifelike operation, are found in practically every branch of the textile industry. Recently a large exhibit of operating textile machinery was held in Boston and almost every commercial type of machine was on display. This exhibit was of interest to foundrymen since the foundry industry is allied closely with the textile machine trade. In New England approximately 10 large foundries are devoted to the exclusive manufacture of parts for textile machines. The estimated melt of these foundries is 156,000 tons of pig iron per year. In addition to the foundries already mentioned, many other plants throughout New England are devoted partly to making textile machine parts. As a rule, the foundry work in making textile machines is of a specialized nature and requires skill and long experience for success.



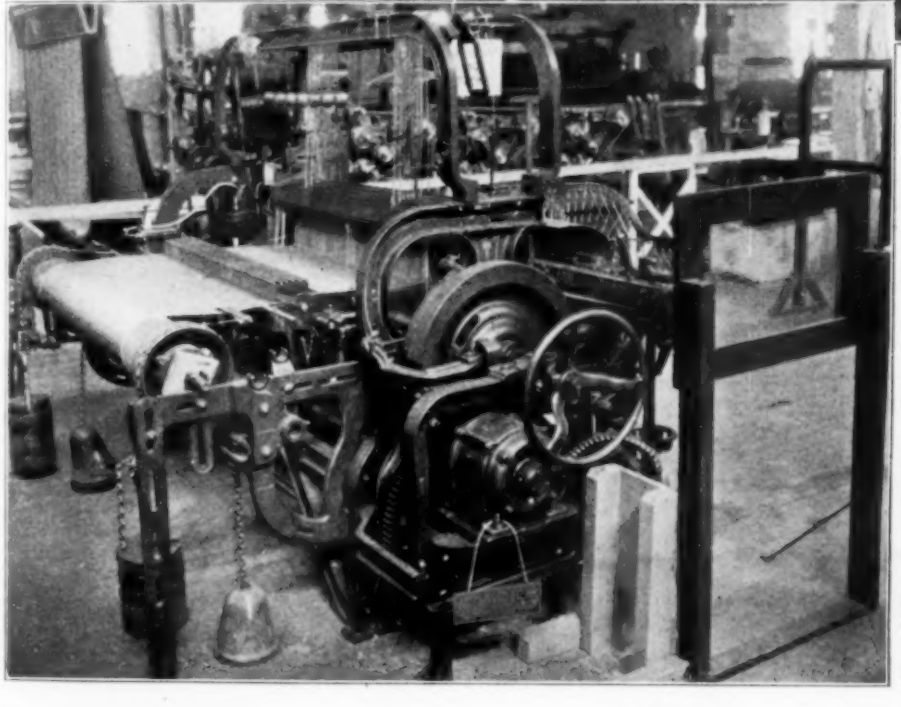


FIG. 1.—THE FRAME OF THIS AUTOMATIC LOOM IS MADE OF GRAY-IRON CASTINGS FIG. 2—CASTINGS FOR LARGE CARDING MACHINES HAVE TAXED THE INGENUITY OF FOUNDRYMEN FOR MANY YEARS

A general idea of the foundry work required in this class of casting

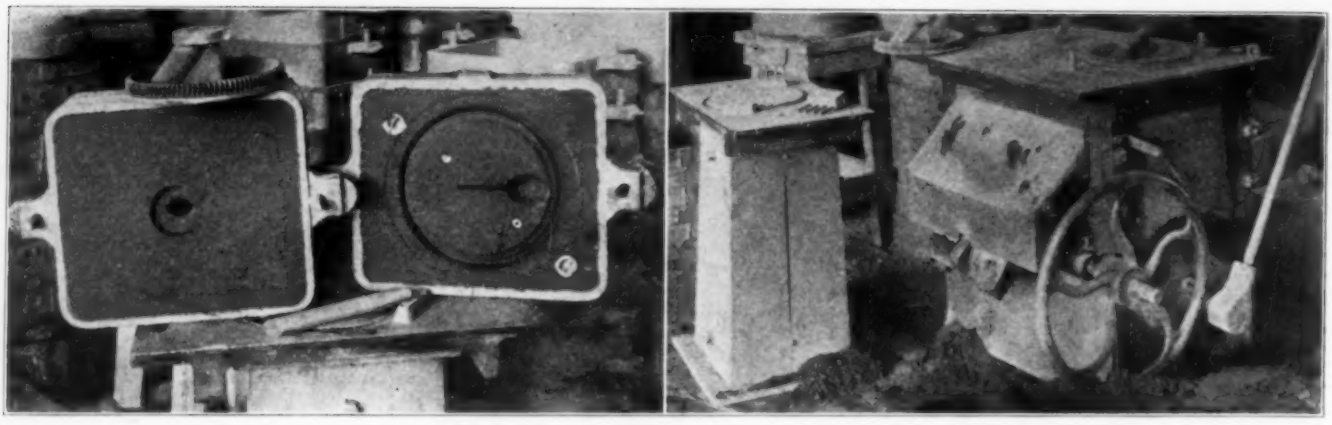


FIG. 3—LEFT—A STRIPPING PLATE MACHINE TRIPLED THE PRODUCTION OF THIS COILER CASTING FIG. 4—RIGHT—HIS SPECIAL MACHINE HAS TWO SEPARATE MECHANISMS FOR WITHDRAWING THE PATTERN

manufacture may be gained from the views of typical textile machines which are shown in the accompanying illustrations. Practically all frame pieces of the automatic loom, shown in Fig. 1, are made of cast iron. The shuttle boxes and many of the smaller parts are made of malleable iron. A carding machine is shown on Fig. 2. In this machine, in addition to the framework, many of the drums are foundry products. A detailed description of the methods used in producing card drums at the Sarco-Lowell shops was given in an article published in the Dec. 1, 1923 issue of The Foundry.

An automatic machine used for knitting underwear is shown in Fig. 11. Here the frame work also is made of gray-iron castings and the small movable parts are constructed of malleable iron. As a rule textile castings are lighter and more complicated than the general run of work completed in a jobbing foundry. Requirements as to dimensions also are more strict in the case of castings for the textile industry.

An example of a good gray iron casting is shown resting on the flask in Fig. 3. This casting is known as a coiler for a drawing frame. A cotton fibre tube of rope, the product of a machine known as a drawing frame, must be coiled in cylindrical containers for storage and transporation. This coiling operation is accomplished by the

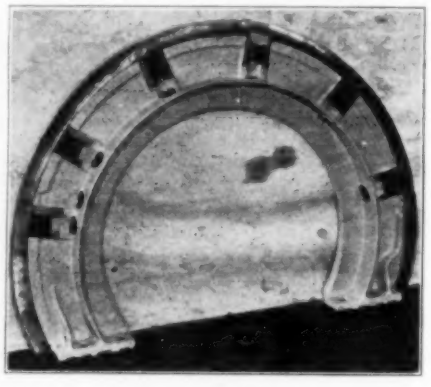


FIG. 5—SPECIAL FLASKS ARE USED IN MOLDING THIS 6-FOOT ARCH

coiler casting. The cotton fiber is fed down from the center of the casting through the diagonal tube portion and then to a drum which has about the same diameter as the outside of the coiler casting. The coiler is revolved by a gear, and by this revolving motion the cotton fiber is coiled on the drums. These coilers are used in large numbers in the textile industry and their production in the foundry has become a standard operation.

The mold for making the coiler casting is made in three parts, the cheek and drag being shown in Fig. 3. The cope is not shown since it merely is a flat surface. The benches on which the three parts of the mold are made are shown in Fig. 4. The drag and the cheek are made on the stripping machine shown at the right and the cope on the bench at the right. In making the drag and cheek on the stripping machine, the two flasks are placed side by side on the bench, being guided in place by dowel pins. The molder sifts sand to fill both flasks lightly and then hand tamps it. Special care is taken in tamping the gear portion of the cheek mold. The remainder of the tamping and filling of these two molds follows the usual custom, but a special feature is to be found in the method of drawing the mold.

The slanting tube in the cheek has the same inclination as the core print in the drag The pattern table is con-

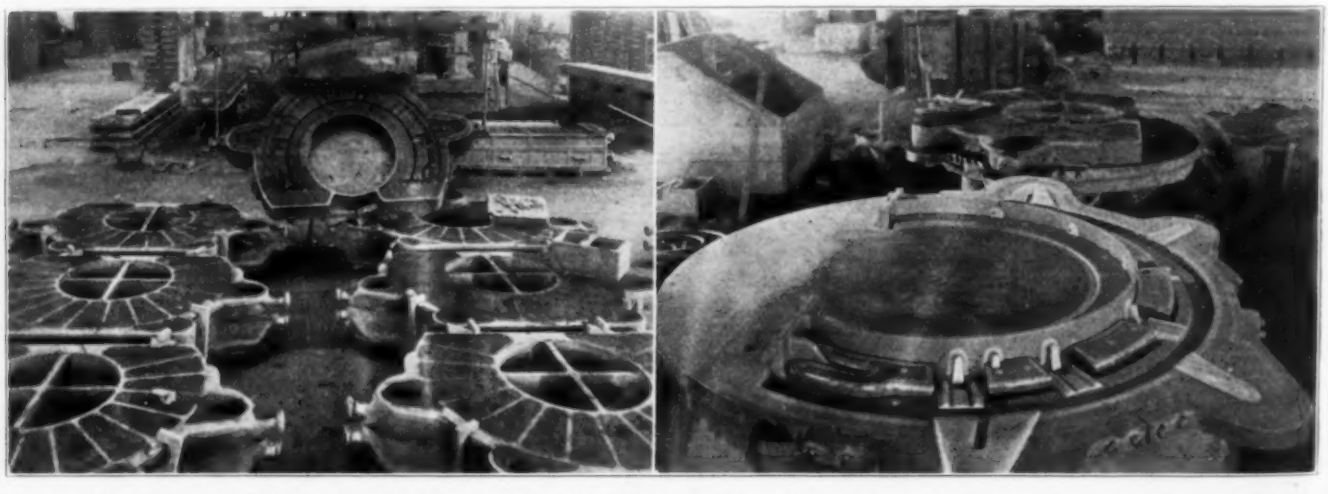


FIG. 6—LEFT—FIVE HUNDRED OF THESE ARCHES ARE MADE EACH MONTH FIG. 7—RIGHT—A STRIPPING PLATE MACHINE IS USED IN MAKING THE ARCH

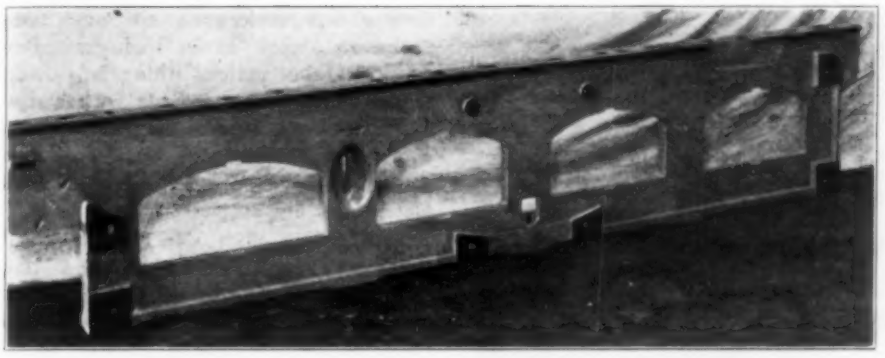


FIG. 8—TWO YEARS OF EXPERIMENTING WERE REQUIRED TO COMPLETELY ELIMINATE WARPING IN THESE CARD SIDE CASTINGS

structed so that the two slanting parts slide down along their own axes when the operator turns the wheel shown in the foreground of the illustration. After the slanting parts have been drawn, the remainder of the pattern is stripped in the usual manner by operating the lever at the right of the table. One of the coiler castings is shown on the table just as it was taken from the mold and at the right on the stripping machine is one of the horn gates used.

The utmost care is taken in pouring these molds. The metal first passes through tube gates and then through the two horn gates at the under surface of the gear disk. The molds are made rapidly although an accurate finish is required. One molder makes 46 complete molds in a day in the stripping machine. When made without the machine, the production declines to 12 or 13 molds per day.

An interesting casting made at the plant of the Saco-Lowell shops at Newton Upper Falls, Mass., is the arch which fits over each end of the drum of the flat carding machine. A machine similar in design to the flat carding machine made by the Saco-Lowell shops is shown in Fig. 2. The arch casting supports the numerous small rolls shown surrounding the large drums. A finished arch made by this company is shown in Fig. 5. The method of producing this casting in the foundry is somewhat unusual. The casting is nearly 6 feet in diameter and is produced in sufficient quantities to warrent highly specialized molding equipment.

The flasks are shown in Fig. 6. The method of handling the drag and cope is shown in the background. A hoist supports an equalizer beam through a ring at the center. A hook is fastened to rings at each end of the beam. A ring at the lower end of the hook fits over a trunnion on the drag or the cope as the case may be. This arrangement enables the operator not only to lift the drag or cope, but also to swing the cope upside down just before lowering into place on top of the drag.

The molds are made upon a stripping machine of special design shown in Fig. 7. In this illustration the pattern is shown partly stripped. The flask used in making this casting is made with a hollow center to reduce the amount of sand required. This construction saves 8 cubic feet of sand to each mold. The sand is dumped on the table from an overhead spout. Pneumatic rammers are used for ramming the molds. On the machine shown, two men can make 30 complete drags per eight-hour day. The stripping plate on this machine operates without vibration. Over 35,000 molds have been made on this pattern with-

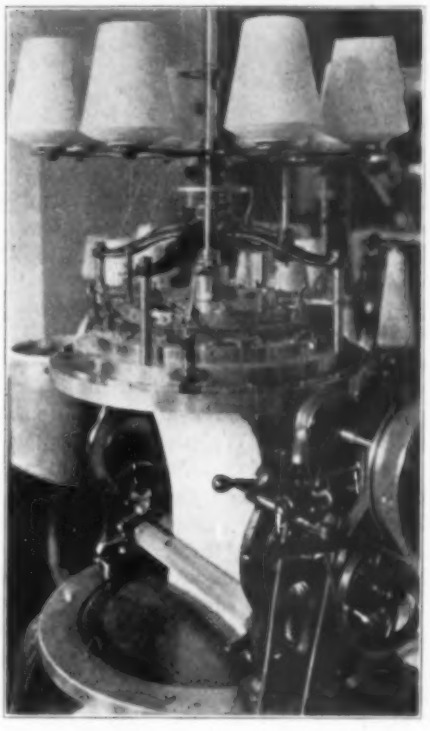
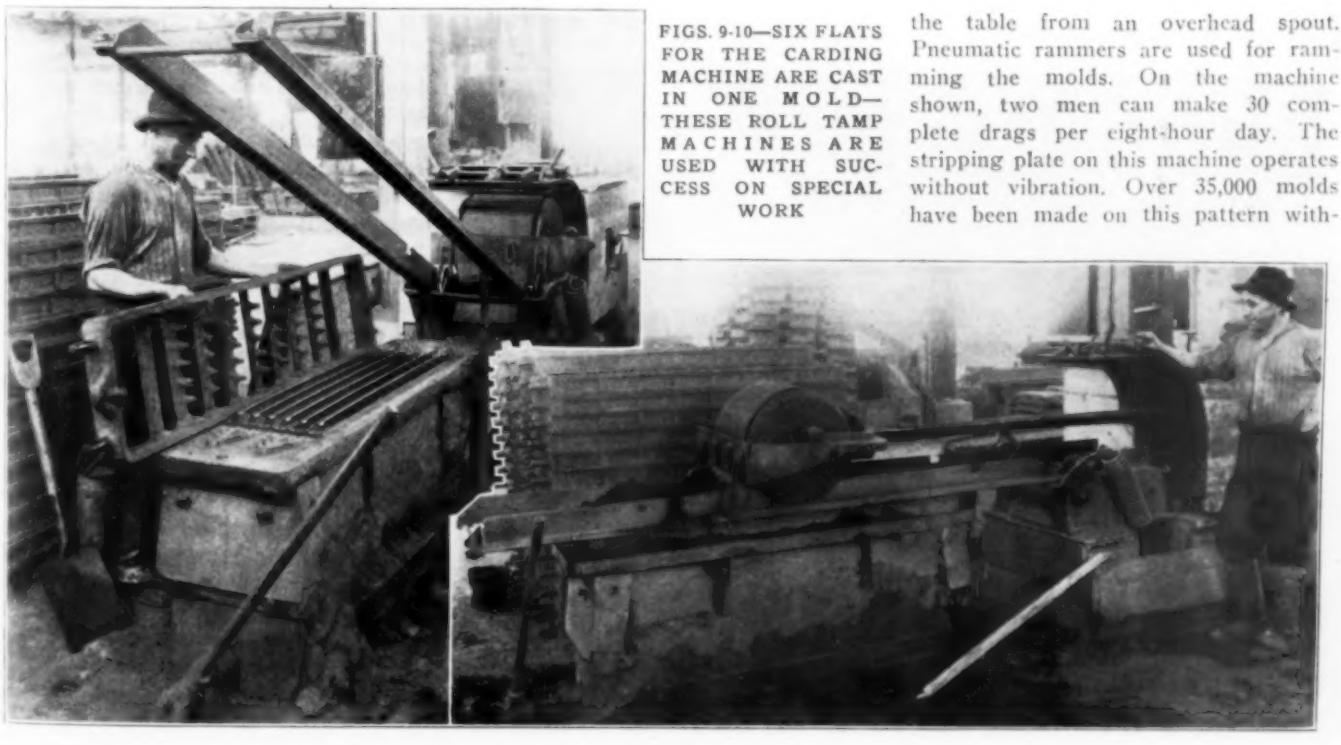


FIG. 11—THIS KNITTING MACHINE AUTOMATICALLY PRODUCES UNDERWEAR



FIGS. 9-10—SIX FLATS FOR THE CARDING MACHINE ARE CAST IN ONE MOLD—THESE ROLL TAMP MACHINES ARE USED WITH SUCCESS ON SPECIAL WORK

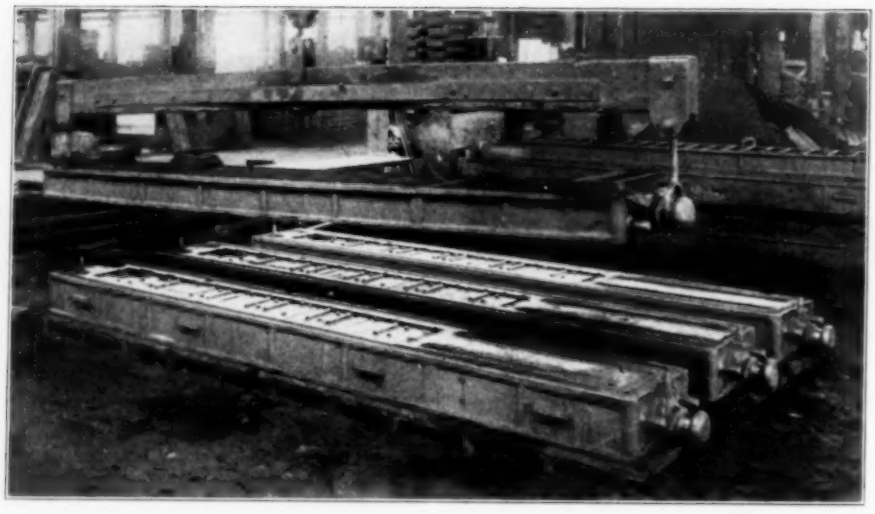


FIG. 12—VARIOUS LENGTH BEAMS ARE MADE IN ONE STANDARD LENGTH FLASK WHICH IS FITTED WITH TRUNNIONS FOR EASE IN HANDLING

out any appreciable wear. The cope is a common flat back made up on the table shown in the background.

After assembling metal is brought to the molding floor in ladles carried on a monorail system. The molds are poured on two sides at once through strainer cores. When the molds are opened and the castings shaken out, the sand is shaken through the grating shown in the center of Fig. 4. The sand then passes through an automatic reclamation process and, properly mixed with new sand, is carried up to bins located directly over the molding floor. The Newton Upper Falls foundry turns out 500 complete arches a month.

The card side casting shown in Fig. 8 forms the main frame of one side of a flat card. While this casting looks comparatively simple, there probably are few cases where the production of a casting has undergone so much experimental work as in this case. Because of the various thin and thick sections considrable trouble with warping was experienced. This was overcome by changing the design of the pattern rather than casting with chill plates or using special risers.

The carding cloth, which passes over the top of a large roller on a flat card machine, is carried on a series of T-section castings known as flats. Each machine requires 110 of these flats, thus necessitating a heavy foundry production of this piece. The molds for this casting are made in various ways. One type of machine which has turned out successfully a large number of these pieces is shown in Figs. 9 and 10. The pattern plate consists of 6 bars laid parallel with gates at

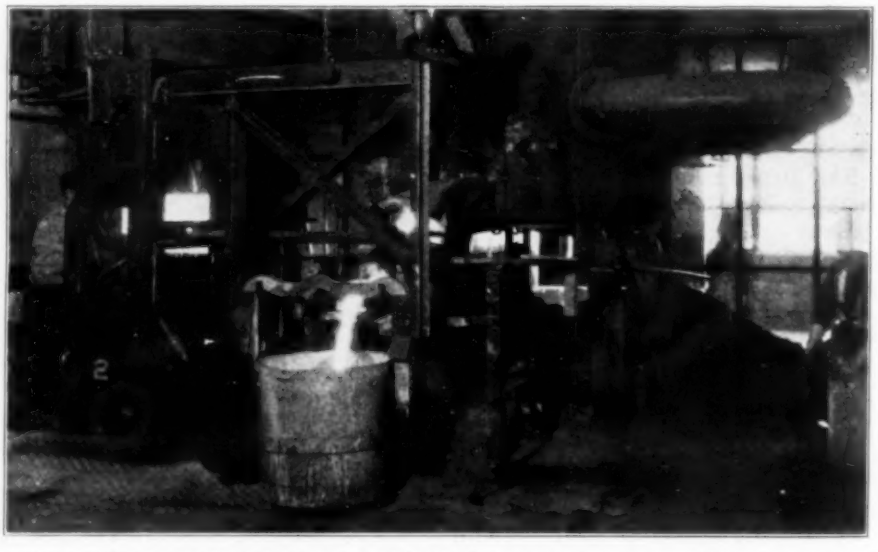


FIG. 13—SUSPENDED ELECTRIC MONORAIL CONVEYORS TRANSPORT MOLTEN IRON FROM THE CUPOLA TO THE FOUNDRY FLOOR

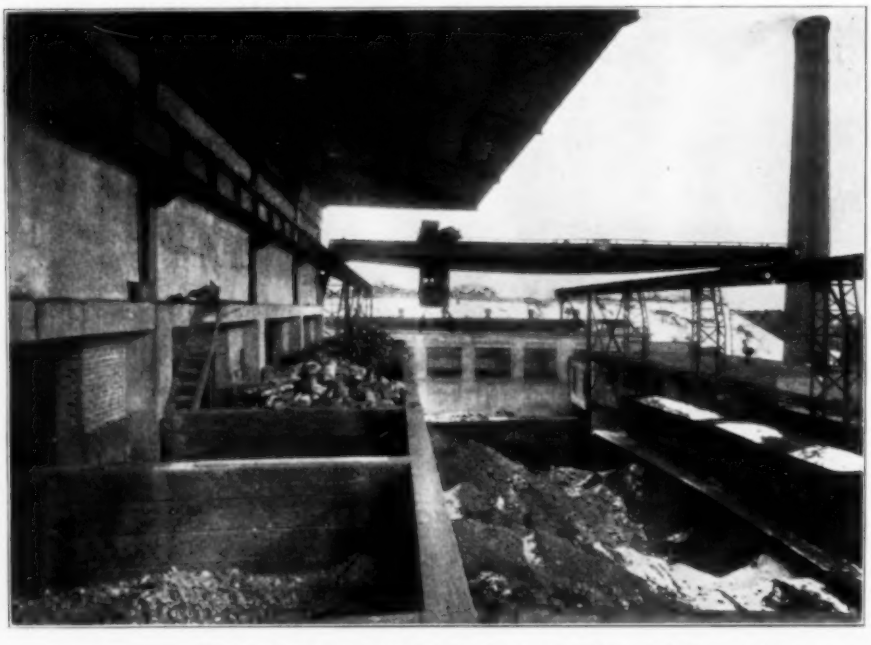


FIG. 14—THE STORAGE BINS ARE SERVED BY A YARD CRANE

both ends. These are placed on the table of the roll tamp machine, the track of which tips up for placing and removing the flask used for this work is of special design. The cross-bar construction is arranged with projecting lugs which come between the bar. This arrangement prevents the sand strips from dropping when the mold is lifted off the plate. The flask is held in place by pins. The flask is filled loosely with sand from a nearby sand heap, is tamped briefly by hand and then is completed with two passes of the roller. One man handles the entire operation with the assistance of a small electric hoist.

Beams used in the frame of textile machinery usually are made of castings. At the Newton Upper Falls plant, various lengths and designs of beams are made in one size flask. The method of making molds for drawing frame top beams is shown in Fig. 12. The

cope and drag are molded on long stripping plate machines and then are placed on the floor for pouring. The molds are handled by a crane which is equipped with a long crossbeam with end rings which engage trunnions on the ends of the flasks.

A short description of the Newton Upper Falls plant will give an idea of the development of the foundry industry as it pertains to the textile trade. This is the latest foundry built by the Saco-Lowell shops for the exclusive production of textile castings, being built late in 1921. The main building has two stories, the foundry being located on the upper floor and the handling and treating equipment on the lower floor. The design provides for expansion of approximately double the present area. The floor layout is rectanglar with two cupolas at the center of one of the long sides. A view of the cupola is shown in Fig. 13. The storage yard is outside of the building and directly back of the cupolas, the general arrangement of the bins and handling equipment being shown in Fig. 14. The crane is equipped with a clam shell bucket and operates over the railroad siding and the entire storage yard. The yard crane also is arranged to fill the stock bins on the charging platform if desired.

The charging equipment is unusually complete. Pig iron, coke and other material are taken from the storage yard in small cars which are raised by an elevator to the charging floor. The equipment of small cars and the storage space on the charging platform permits making ready an entire charge on the floor before any material is placed in the cupola. The charging floor is made of creosoted wood blocks.

The blowing unit for both cupolas is located on the mezzanine floor. Traps are provided directly under each cupola so that the drop passes through the floor of the foundry to the ground floor below. Pouring practically is continuous from morning until night, the plant capacity being approximtaely 150 tons per day. The cupolas are lined to 54-inch diameters.

All parts of the foundry floor are served by an extensive overhead rail system. Suspended electric monorail conveyors transport molten iron from cupolas and handle castings and other materials. An extension of the monorail system runs from the foundry to the pickling house. The plan of the plant is such that the castings from the foundry pass to successive lower levels in the finishing and machining departments. One of the monorail conveyors is shown in Fig. 13. The ladle is held in a low position in front of the cupola for filling and then the entire carriage is raised 8 to 10 feet for transporting about the foundry. One man is required for each conveyor and these operators become proficient so that the metal is delivered to remote corners of the foundry in a surprisingly short time.

The entire foundry is departmentalized. Work of a certain definite character always is made in a specified area and this department is operated as a small foundry. The sand and core supply and the molders within the area are pratically independent of the rest of the plant. For example the sand from the arch castings is shaken out over gratings located in the arch casting area. The sand drops into hoppers underneath, then to individual sand mixing machines and finally is carried to hoppers above the foundry floor which serves the arch casting area. In a similar way, the sand in each of the other departments is claimed and used again in that particular department.

One Man Welds Ton of Castings Daily

EFFICIENCY methods in connection with a welding outfit enable one man and helper to reclaim over a ton of small castings every working day in a plant devoted to the manufacture of domestic heating furnaces, according to a writer in *Oxyacetylene Tips*. The castings for the most part are defective fireboxes, water jackets and other cast iron parts. Blowholes, cracks and other small defects are welded satisfactorily. It is stated that the welded section rarely fails to pass the test to which all castings are subjected.

A small shop immediately back of the main group of buildings is set apart as a welding shop and is equipped with a chain hoist and a preheating furnace. The chain block is suspended from an *I*-beam and serves to move the heavy castings from one point in the shop to another. The preheating furnace is built of firebrick reinforced with plates and angles and is about 8 feet square by 3 feet high. The fire is maintained on a set of cast iron grates mounted on suitable supports about 6 inches above the floor line. The volume and intensity of the flame is controlled by a blast gate in the pipe through which air is forced by an electrically driven blower.

In reclaiming a defective casting the edges of the crack or break to be welded usually are chamfered. The casting then is placed in the preheating furnace where it is raised to a cherry red heat. Afterward the casting is removed to a welding table near the furnace and there welded. An unusually good cast iron flux is employed to float all impurities to the surface where they are removed by scraping them off with a special alloy filler rod.

Some of the work presents comparatively difficult features. For example where it becomes necessary to close holes or fix breaks in one of the thin walls of a jacketed shell. Skillful control of the molten metal is required to prevent it from falling into the space between the two walls. The operator starts along the beveled edge and maintains the bevel by constantly adding metal first to the bottom and working upward. In this manner the metal readily is controlled.

After the casting has been welded it is placed on the floor and covered with dry asbestos cement. Because of its excellent insulating qualities this material retards the cooling speed and prevents strains incident to too rapid contraction. This method insures a better grained structure and a machinable casting. Sand mixed with ashes formerly was employed as a covering agent but was discarded in favor of the asbestos cement which is cleaner, easier to handle and more effective.

If the casting is part of a steam or water circulating system it is taken to the testing room and subjected to a hydrostatic pressure 50 per cent greater than the specified working pressure. In this manner the manufacturer is reasonably sure that it is tight and is strong enough to present a satisfactory safety factor.

Besides the repair work on defective castings, a considerable amount of repair welding is done on foundry flasks and miscellaneous machine parts for other departments of the plant.

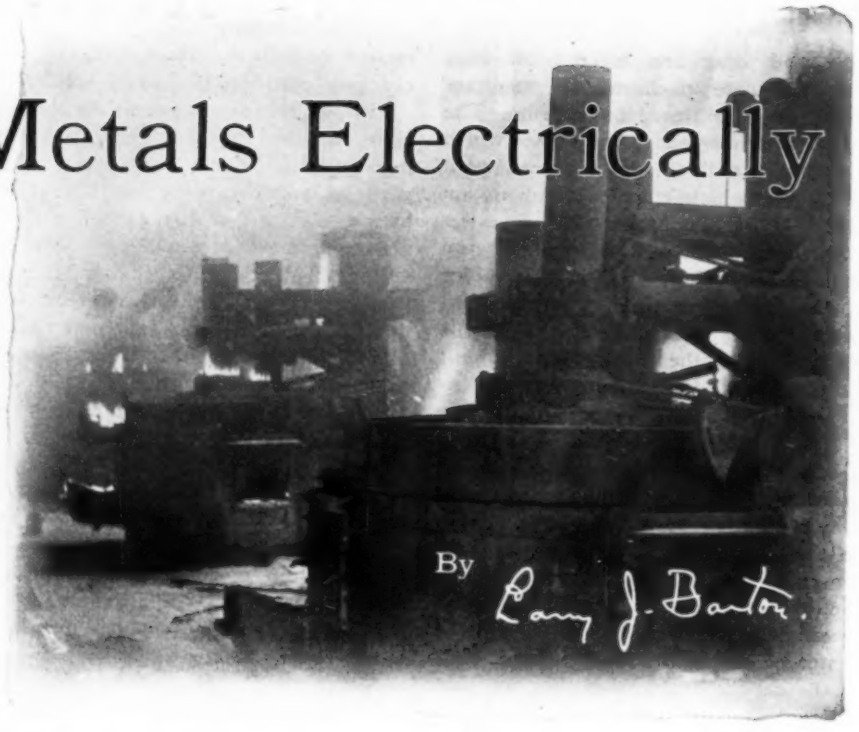
Move Eastern Office

L. D. Burke has been made representative in Connecticut of the Pennsylvania Pump & Compressor Co., Easton, Pa., with offices at 68 Starr street, New Haven.

Occupy New Building

The Los Angeles branch of the Chicago Pneumatic Tool Co., New York, has been moved from 307 East Third street to their new building 655 Santa Fe avenue, Los Angeles.

Refining Metals Electrically



Chapter II

Keeping the Furnace in Operation — Lining Is Important

AN ELECTRIC furnace, like any other machinery, always must be kept in the best of condition if the best results are sought. While a furnace is merely a steel shell, lined with brick, and on first thought to keep it properly lined would seem to offer a simple problem, such is far from true. The economical operation of an electric furnace, and the steady production of high class steel implies a minimum of trouble with the refractories used. The brick used in furnaces are rather costly and the labor required for roof and wall building constitute an important item in the foundry. The reduction of these items as much as possible is one of the basic points required of a good melter, and naturally is made possible by obtaining as great a number of heats as can be had. Hearth trouble is another point of great difficulty and often results in a heat of defective steel, caused by pieces of the bottom material coming up and throwing back the slag.

The only real teacher of the many small points necessary for steady, economical operations is experience, and often the lesson is learned at great cost, both to the melter and to the company.

When a furnace is installed in a new shop, it consists of the electrical equipment, and the furnace shell. Usually the manufacturer sends a man to start off the equipment. He remains until the first ten or twelve heats have been poured. The furnace then is accepted by the company and turned over to the melter. If he is an experienced man there probably will be no difficulty, but the trend in many shops has been to take a helper, or some other similar type of man and make him a melter. It is foolish to expect such a man to acquire from the manufacturer's representative in a few heats the experience necessary to make good steel. If this man formerly has been an open hearth or converter man he will, in all probability, be able to make good steel. But he will be unable to attain economical operation in his furnace, as such equipment is vastly different from any of the older processes of manufacture. Therefore, it is not uncommon to note the great variance in results obtained on similar furnaces making the same classes of steel.

The initial step is bricking the furnace preliminary to putting in the hearth. While different methods of laying the brick are followed depending on the make of furnace, for purposes of illustration the most common type of furnace, the three phase direct arc will be considered. These may be represented by such makes as the Heroult, Pittsburgh, Ludlum, and Greene, which while of different hearth shapes are handled in the same manner.

Furnace shells always are built deeper than required to give a high factor of safety, and to enable the furnace to handle heavy overloads if required. This extra depth generally is filled with some sort of a cheap, and medium refractory material, the most common being fire brick. Straight brick are used, and are laid on the flat side, two high. First about one inch of a stiff fireclay mud is placed on the shell. The initial course of brick are set into this, care being taken to make all joints as tight as possible. As these brick constitute the last line of defense in case of serious bottom trouble, it is as necessary to take as much care on this operation as on the hearth itself. After the first layer of clay brick is set the surface is washed with a thin, fireclay slurry, the mixture being forced down into all cracks by steady sweeping with a common broom. When no cracks are seen the second layer may be laid.

The brick in this layer are placed in the same manner, with the exception that only about ¼ inch of clay mud is used, of such a consistency that it tends to ooze up through the joints as the brick are forced together. When the course is complete, the mud slurry is used again as before mentioned.

Progress from this point will depend upon the method used to form the hearth, of which there are two. These are as follows:

Forming complete hearth of grain magnesite.

Forming the hearth shape with magnesite brick, requiring only a thin area of grain magnesite.

If the first method is to be used the brick will be laid as shown in Fig. 6. On laying the first course of magnesite brick, care must be used to form a good bond with the preceding clay course. This is accomplished best by the use of sodium silicate or as it is more commonly known as *water glass*. This is a viscous liquid, which upon drying hardens into a true silicate with

Preparing Furnaces

MEASURED in terms of economical operation, too much stress cannot be given the problem of laying the bottom, lining and preparing the roof of a furnace before its first heat. In the accompanying article in Mr. Barton's series, the simple steps involved are outlined. The different types of construction are studied from the standpoint of economical service and long life. In an article to follow, analyses of lining materials, comparisons of cost factors and other items controlling the decision as to furnace lining will be considered.

good bonding qualities. As it hardens quickly, only small sections are laid at a time. The clay course is swept free of any superfluous fireclay and is ready for the magnesite brick. Each brick is dipped into the sodium silicate so that it is thoroughly covered and is quickly shoved into place. This operation is continued across the entire furnace, all cracks are filled by pouring a small amount of the silicate into them, and the second course is laid in a similar manner.

Prefer Magnesite Brick

Some furnace men prefer to lay the magnesite brick in a bed of finely ground magnesite, contending that a basic brick should be laid in material of its own composition. While this is true from a chemical standpoint it is not so in practice. If the hearth gives way, the hot metal is allowed to run down upon these brick. The powdered magnesite between the brick provides no bond, and the chances are that the metal will displace the filler and go through to the clay brick. With the sodium silicate, a bond is produced as strong as the brick itself and there is no chance for the metal to go further. Consequently, when the heat is poured it often is possible to patch directly on these brick with no shutdown required to clean the hearth of set steel. That this is important in eliminating a shut down requires no argument. The main point of adverse opinion on this method is the fact that an acid binder will slag out the basic brick. This would be true if it were placed in a position where high temperatures were constant, but under hearth conditions where these high temperatures are infrequent, this argument is a fallacy. The writer has seen cases where several heats in succession were made directly on the bottom brick, and there was no vestige of erosion other than the small amount of spalling caused by changes of temperature. Cases also were noted where powdered magnesite was used, and in each instance the metal went through to the clay course. Another reason brought forward in favor of powdered material over the cement is the consideration of expansion, the exponents of the former claiming that any small clearance between the brick is taken up when the furnace becomes hot. They state that a brick set in sodium silicate has no means of expanding, and is likely to buckle, causing hearth trouble. While this argument is sound theoretically, the actual facts are that the temperature of this course is never high enough to cause trouble from a material with such a small expansion as magnesite.

As soon as this second course of magnesite brick is laid it is time to begin on the side walls. These will be laid of 9-inch magnesite brick, sufficient keys being used to make the circle. These brick are laid dry, and are fitted rather loosely, about ¼ inch clearance being allowed to the lineal foot. Such a tolerance is continued until the walls are within a few courses of the metal line, when this expansion is increased to about ⅛ inch between each two bricks. Often, powdered magnesite is used between the bricks, but this is not at all necessary and is only an added expense.

The height to which these basic brick will be laid depends upon circumstances. Formerly it was the custom to lay basic brick for a few inches above the slag line, the remainder of the furnace wall being laid with silica brick, but in the last few years the use of basic material for the entire wall has increased. This point will be covered more fully under special refractories.

Assuming that silica brick will be used from the slag line to the roof they will be laid dry the same as the magnesite. Often, a course of some neutral refractory is laid between the acid silica and the basic magnesite, the more common being chrome brick. Results have not proved the necessity for this, although there is nothing against such a procedure except the high cost of chrome. These silica brick are laid with an expansion tolerance of not less than 3/16 inch per foot, which will be taken up quickly during the heating preliminary to burning in the hearth.

When the brick are laid up to the proper height, the jambs are placed and the arches laid. Special brick with rounded corners are used for the jambs. These are placed staggard for added strength. For the best results, these brick should be dipped in sodium silicate, or some other refractory cement that a better strength may be had by bonding. The arch brick should be set in the same manner, and it is always better to lay a two high arch if space permits. As the arch is the weakest part of the lining, great care should be exercised to obtain a true curve, and plenty of refractory cement should be used. The brick used should fit snug enough so that any pressure only tends to bind it tighter. After the arches are completed, pieces of brick are fitted in to make a level surface upon which the roof will set.

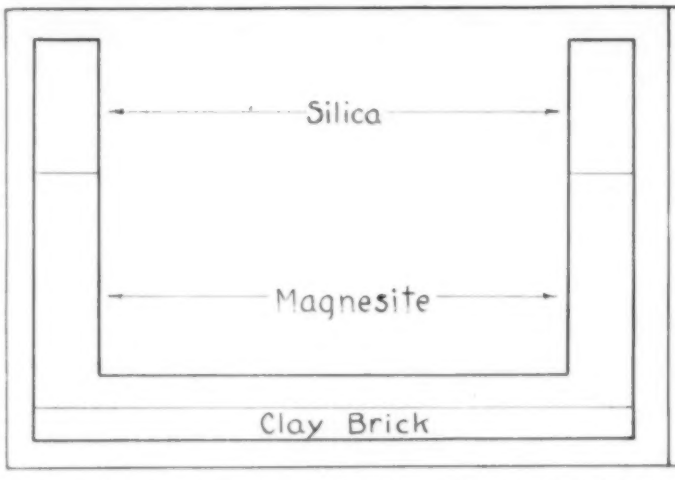


FIG. 6—SIMPLE METHOD OF LAYING BRICK FOR HEARTH AND WALLS

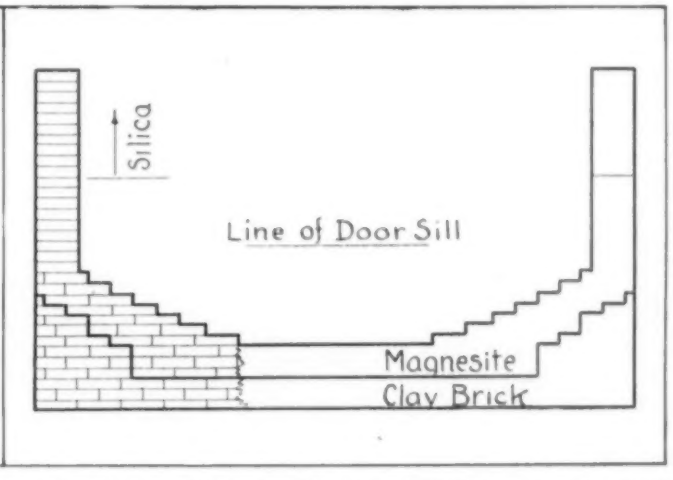


FIG. 7—SECOND METHOD OF BUILDING HEARTH BY OFFSETTING BRICK

Second Method Suggested

With the second method of building the hearth to shape with magnesite brick a similar procedure is followed as far as the first two courses. From this point, the brick will be offset, the amount for each course depending upon the shape of hearth desired, the size heats for which the hearth will be laid, etc. The way such a setup appears is shown in Fig. 7, the dead corners being laid with clay brick for cheapness.

The cost of the two methods is about equal, the first requiring less magnesite brick, but more grain magnesite. The second reverses this condition. In the

long run, the second method is far superior to the first for many reasons. These are as follows:

The second method gives a great saving of time and power required in the burning operation.

With no dead corners to burn in, a better bottom is assured as the magnesite may be spread more evenly, and a more uniform burning takes place over the entire hearth.

With the approximate shape already laid out, it is easy to build the hearth to proper size without giving an undue depth in the center.

With such a secondary brick bottom, the odds are that the metal always will drain clean, even though a bad hole may form, allowing easier patching.

That these points are appreciated is shown by the ever increasing number of hearths made in such a manner.

Building the Roof

Roofs used on electric furnaces are in the great majority of cases made of silica brick, although recently there have been quite a few instances where carborundum brick have been used. However, their cost is so great that it is a question whether the added life will counteract such an excessive price, although the points in their favor are numerous. All furnace makers supply with their equipment two roof rings. One is maintained as a spare, to keep a roof always set up for an emergency. This ring is set around a form shaped to the desired contour upon which the brick are set. Many ideas are in vogue for making a form, the use of wood, cement, and iron castings being common. As this is a fixed asset it is necessary that some sort of a permanent arrangement be made as every roof will necessitate such a form for its construction. A form made of cast iron is more satisfactory than any other. It may cost more at the start, but its many fine features rapidly will pay for the extra expense.

In making this casting, a sweep can be used, which saves the cost of a pattern. An iron form is smooth, easy to handle, indestructible, and does not tend to warp or change in size as does a wood form. It may be made of rather thin section, and is cheaper to construct than a similar shape of concrete.

Two ways of making a roof are suggested. These involve using standard shapes, or using patent brick. The patent brick are made of a special shape to exactly make up the roof. Consequently, they are easier to lay and a saving in time is effected. Due to their better fit, longer life is obtained than from roofs made of standard shapes. A comparison of costs between the two methods depends greatly upon the continuity of operation. Under conditions of steady operations, where from six to 10 heats per day are being made, the patent roof will give superior service, due to the fact that the brick are considerably larger than standard shapes, and that there is little chance of the roof contracting due to cooling down. Under intermittent operations where the roof is allowed to cool over night, the patent bricks, of large size, tend to spall and crack badly and the service obtained is not nearly so good as if ordinary silica brick are used. As a patent roof costs considerably more than one of common brick there must necessarily be sufficient greater life obtained to overcome this extra cost.

Under conditions where only a few heats are made each week, a roof made of common fire brick probably will prove more satisfactory than one of any other kind of material. The roof brick are cheap when compared to silica refractories. They may be made to fit perfectly by grinding to shape on an abrasive wheel. They do not tend to spall, but burn in nicely and give a comparable life in number of heats.

Regardless of whether patent or standard brick are used there are certain points of importance to consider in laying the roof. These are as follows:

Some arrangement must be made to take care of expansion when bringing the roof up to steel making temperatures.

A similar arrangement must be made to prevent any slipping of the brick should it become necessary to allow the roof to cool.

The brick must be so laid that there will be neither bulging nor sinking after operations have commenced.

Expansion is handled by expansion strips, which may be made of any combustible material, such as wood, paper, cloth, etc., which will burn out as the temperature rises. The number of expansion strips to use will differ, depending upon the regularity of operations. If continuous operations are assured, rather heavy strips will be used as expansion will be taken up over the first three or four heats. In this instance wood strips are preferable, shingles being an excellent material, and are used to give an expansion of approximately 3/16 inch. Any loose brick can be tightened by driving in small wedges, enough being used to insure sufficient tightness to allow lifting the roof upon the furnace.

For intermittent operations, expansion allowance of about ⅛ inch per foot is preferable and to allow this paper can be used between the brick. Magazine pages are excellent as they can be quickly prepared of any thickness, and readily burn out on the first or second heat.

To prevent the brick slipping they are so laid that each brick is tied in. By using keys and wedges throughout, this condition is attained, and by using a severe starting angle each brick is resting against the one behind it in such a manner that there is small possibility of a brick slipping through.

Bulging or sinking in a roof is the direct result of too light brick laying or *vice versa*, and is only overcome by an exact computation of the expansion which will occur. The best method of overcoming this, is by recording carefully the exact manner in which each roof is laid, and watching it throughout its life. If it is found to bulge too much, the record of building is examined and on the next, expansion strips of a slightly greater thickness are used.

In shops where steam is available, a coil may be laid under the roof form, and free coursing of steam always allowed. This tends to dry the brick slowly, and always keeps the brick warm. The result of this is found in a great increase in the number of heats possible. Most roofs on the first few heats spall badly and often two or three inches of effective refractory is lost in this manner. This is the direct result of moisture under the influence of a too rapid heating. However, with a perfectly dry roof a rapid heating up will not affect it in the least. The cost of the steam is negligible when compared to the saving in roof refractories, time lost for repairs, and unnecessary labor.

Dry With Wood Fire

If it is impossible to obtain steam for drying, an excellent method is to block up the roof on bricks several hours before it is to be placed in operation and build a wood fire under it. This fire is started slowly, only enough wood being used to give a series of feeble flames. After the roof becomes blood warm these fires can be gradually increased until the brick are red hot on the under surface. The roof is kept at this temperature until ready to place on the furnace when it is quickly lifted and set. By this time all of the residual moisture has been removed and when the arc is thrown on, the roof gradually expands without spalling.

The roof being ready and the walls laid, the next step preliminary to making steel is building the hearth or as it is commonly known *bottom making*. There are three ways of performing this operation as follows:

To ram in the complete hearth at one operation and bake until set.

To ram in a layer at a time, bake, ram in, etc., until the desired contour is obtained.

Set electrodes in the hearth and gradually sinter in the refractory until the bottom is of the desired shape.

While ramming the entire bottom is

quick and easy on the operator, it is unsatisfactory in that it becomes an impossibility thoroughly to sinter through the entire hearth depth at one such operation. Assuming magnesite is to be used for the hearth, it is laid out in piles of about one sack each, probably 200 pounds. If desired, a small amount of binder such as open hearth slag may be mixed and used. On the lower courses this slag may be used about one to six, gradually tapering down to about one to 12 for the upper section where the steel will lay. Care must be exercised in the selection of this slag to obtain a low phosphorus content or one of the main basic features will be destroyed and the steel will pick up this troublesome element from the bottom. If basic, open-hearth slag is used it must be low in phosphorus, which is rather unusual, so it is better to use slag either from the acid electric or the acid open hearth. This slag has a much lower melting point than magnesite and will melt and flow around the grains of the latter forming a true bond during the setting. If too much is used, the hearths resistance to high temperatures will be weakened; if too little, there will be insufficient bond for the magnesite.

In addition to this some sort of a bonding material must be used to hold the refractory together while being rammed into place. There are many different classes of material used for this purpose such as tar, pitch, glutrin, sodium silicate, etc., most of them tending to burn out during the sintering operation.

As tar is the most common its use may be assumed. Some sort of a pot must be made to melt the tar, a good grade of roofing tar being acceptable. As soon as melted, a heavy coat should be brushed over the bottom brick, and the first magnesite mixture quickly started. The tar should be mixed with the refractory in sufficient quantity to enable it to be rammed tight. Great speed is essential that each layer may become part of the previous one without the tar setting. Air rammers are used and this procedure is continued until the hearth is of the final shape. Molten tar is brushed along the side walls where the hearth impinges, further to bind the bottom to the sides. As this tar will burn out on heating, the hearth made in this manner must be made thicker than desired so that after this contraction it may be of the proper depth.

Making the Joint

As soon as the desired contour is obtained, the hearth should be shaped along the walls and built up as high as possible on the sides. When this is done the furnace should be well cleaned and the roof set. On the tops of the wall brick, place a ring of thick mud containing a high proportion of silica sand so that when the roof is set this will squeeze out and make a perfect fit.

A small wood fire is started in the furnace and allowed to burn slowly for several hours until the wall and roof brick become warm when it is increased gradually and kept going until the heat can be felt through on the bottom of the furnace shell. Coke then may be thrown in until the hearth is covered to a depth of about 5 or 6 inches. As soon as this is red, the electrodes may be lowered and the arc started. The power is placed on the lowest possible point and is brought gradually to the point where the roof and walls are glistening, but not running. The hearth then is held under this temperature for from 12 to 24 hours depending on the size of furnace and thickness of hearth. A 3-ton furnace with a hearth of from 6 to 8 inches in thickness will take almost 12 hours. A sharp pointed bar is inserted into the furnace at stated intervals and shoved into the hearth. This shows the progress of sintering, and as soon as the test shows finished, the current is thrown off, the furnace cleaned, and all is ready for the first heat of steel.

While a hearth made in this manner often proves satisfactory, it is certain that it is not high class workmanship. The point of greatest burning will be directly in the center under the arcs, and gradually will taper off to the side walls where the burning in the dead corners will be insignificant. Consequently, there will be a time when a bad hole will develop and the metal will force its way under this half burned mass with the result either that the entire hearth will come up, or the bottom will start to loosen and large chunks will tear free. The writer has seen entire hearths come up and float on top of the metal requiring terrible work to save the furnace without allowing the metal to scull. A bottom set in the manner mentioned in a basic furnace is too risky and should not be allowed unless it is intended for a test to last for only a few weeks while basic operations can be tried out.

Ramming bottom in layers is slower than direct ramming, but gives better workmanship, and is not so likely to cause the trouble often encountered on the straight rammed hearth.

The procedure is similar to the foregoing in that the same general ideas are followed regarding bonding material, etc. For the first layer, the bricks are painted with tar, and the mixture rammed in about 1½ to 2 inches thick. The furnace is heated and coke added when the arc is struck and baking proceeds until this layer is completely fused. The current is shut off, the furnace cleaned, allowed to cool down, and other layer rammed into place. As the layers approach the finished shape the percentage of slag to magnesite is lowered and each layer has a longer period of sintering.

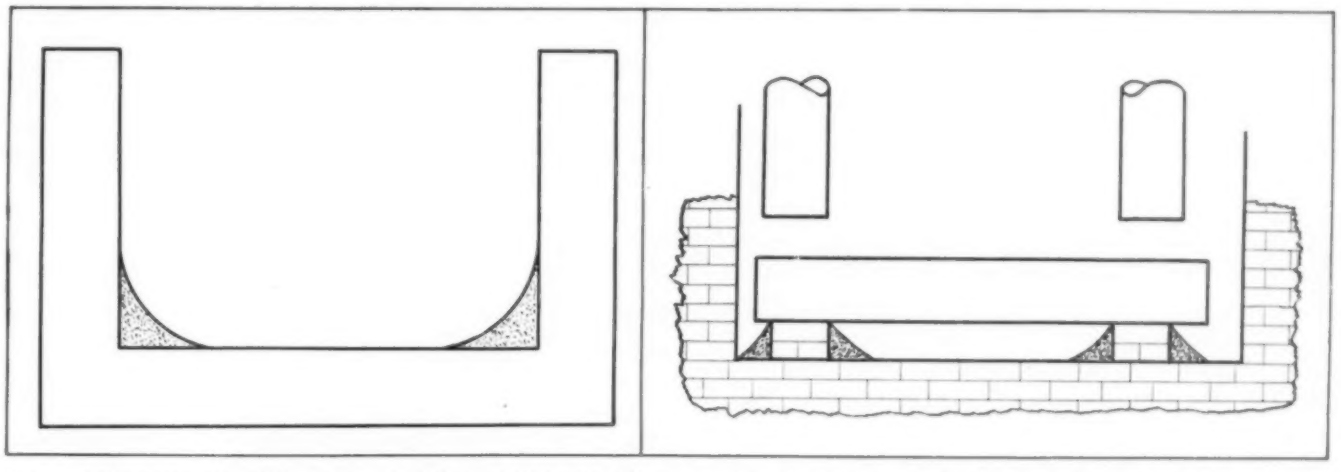


FIG. 8—BUILDING UP THE DEAD CORNERS PREPARATORY TO BURNING IN BY LAYERS FIG. 9—ELECTRODE SETUP FOR SINTERING IN THE BOTTOM

This method allows an inspection of each layer as it is placed, and insures a freedom of unburned spots. The main objection is the length of time necessary to complete the work, together with the fact that the bond between layers is none too secure. Trouble often is encountered from this as the metal may work down to this joint and result in forcing up an entire layer of the furnace hearth.

Gradually sintering in the refractory is the only entirely satisfactory method of making a hearth for the basic furnace, and while it is more costly and is a hot, and hard job, the energy and expense will be more than repaid by the absence of trouble when steel is produced. By this method, a hearth is obtained which consists of one monolithic mass, truly burned, and capable of standing the temperatures of extremely high heats with no danger of coming up. To burn in a good hearth properly requires considerable skill and experience, and as this feature of furnace work is so important, considerable amplification on this subject will not be amiss.

If the bottom has been built flat, the first step will be to ram in sufficient magnesite and tar mixture to build up the dead corner as is shown in Fig. 8. This tends to give a slight start when burning is commenced, and aids in beginning the curved shape. If the hearth has been shaped of magnesite brick there will be no necessity of this and the electrode setup may be placed.

This electrode setup is intended as a neutral connection upon which the arc will be struck, and as it must stay in place until the hearth is finished the greatest care must be exercised to insure sufficient strength to outlast the entire burning operation. The electrodes comprising this connection must be placed high enough up from the bottom brick to allow whatever depth of hearth is desired which will usually be from 5 to 8 inches. They will be set on magnesite brick as shown in Fig. 9, with the top brick slightly chipped so that there will be no danger of the round electrode tending to roll off. Around these brick enough magnesite mixed with sodium silicate is rammed so that there will be no danger whatsoever of the brick spalling away and allowing the setup to drop. The lengths of electrode will be such that about 8 or 9 inches is allowed on the ends from where the arc will strike so that no trouble will be encountered with burning away during the operation.

The shape of such setups will depend upon the position of the furnace doors, and will be such that the greatest possible area of furnace bottom may be reached from the doors. Fig. 10 shows a star setup which is commonly used on the smaller size furnaces. The electrodes are chipped carefully so that a good fit is obtained at the joint, and a plug set as shown further to strengthen this connection. The plug may be set either on the top or bottom, but must be so fitted that when the setup is finished it is extremely rigid, and does not move on shaking. The joint of the electrodes then is plastered carefully with carbon paste or electrode compound and allowed to set. This arrangement is suitable for furnaces up to 3 tons in size as it can be made easily, and of sufficient strength to withstand considerable abuse.

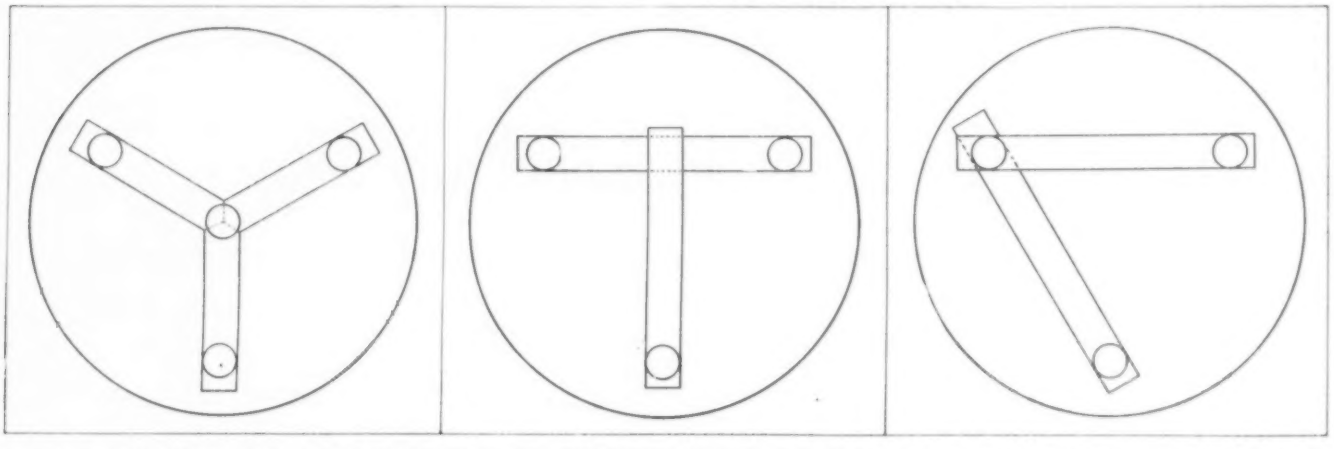


FIG. 10—STAR SETUP FOR ELECTRODES USED IN BURNING IN THE BOTTOM FIG. 11—ELECTRODE SETUP FOR LARGER FURNACE FIG. 12—ELECTRODES PLACED IN THIS MANNER ARE STRONG

Carbon Electrodes Preferred

For larger furnaces where the electrode span is greater a more suitable arrangement is shown in Figs. 11 and 12. Both of these are strong, and do not require so much chipping, which is difficult on electrodes over 10 inches in diameter. The fitting of these electrodes may be done by an air gun and chisel which is an excellent method of obtaining a quick and tight fit. Carbon electrodes are much to be preferred over graphite for this setup due to their greater strength.

This neutral connection being placed, the next operation is the drying out of the furnace. If gas is available, it is prefered. A pipe may be inserted from each side of the furnace and a light flame used for the first 2 or 3 hours. By this time the roof will be warm to the hand, and steam will be issuing from the furnace vent holes. The flame may be raised gradually until the interior brickwork is at a dull red heat. If there is no gas, an oil torch may be used, or some arrangement which will not give too sharp a flame. Wood or coke may be used as a last resource, but are objectionable in that the furnace must be allowed to cool sufficiently for a man to get inside and clean out the ashes and unburned residue.

When the interior brick work is at a dull red, it is safe to assume that most of the moisture has been evaporated. This preliminary heating should not be forced, but should take from 8 to 12 hours, always remembering the old adage, "it is better to be safe than sorry." The electrodes now may be lowered and the arc started. Current should be at the lowest figure which will hold the arc steady. After several hours, the power gradually may be increased until the greater part of the refractory expansion has been taken up and the brick are at a red heat. As soon as the roof and walls begin to glisten it is probably time to begin making the hearth.

A small amount of sample mixture containing about one of finely ground slag to five or six of grain magnesite is made up and a small pile placed on each door sill. After about 15 minutes this may be examined and if thoroughly sintered, the furnace is hot enough to start operations. A few shovels of slag are dusted over the bottom brick, and melted sufficiently to allow the molten mass to run into any open cracks. This also makes the bond between the mag-

nesite and the brick. As soon as this molten condition is obtained the first magnesite mixture is thrown in with shovels, being distributed carefully over the entire hearth to a depth of not over ½ inch.

Small samples may be taken intermittently by a special tool made for this purpose. This tool is shovel shaped of a size about 3 inches long, 2 inches wide, and ½ inch thick, with a sharpened end, and a handle at least 10 feet long. The method of taking such a test is to poke this chisel point into the bottom mass and withdraw a small quantity from several different parts of the furnace. These tests should all show a perfect sintered condition before the next addition.

If any portion of the hearth seems to be running badly, it means that the proportion of slag is too high, and it should immediately be touched up with a small amount of pure magnesite until the proper sintered appearance is obtained. If any part refuses to sinter it must be lightly touched up with a small amount of the slag. As soon as one layer is finished, it is time to add the next, and this is continued until the hearth is nearly finished. This is the most critical time in hearth building. The bottom is assuming a finished appearance, and the men are becoming tired out. The tendency at this point is to try to rush operations and carelessness must be avoided or trouble will be the result when steel is being made.

When the center of the hearth has attained the desired depth, the side walls gradually may be built to shape. A spoon is used so that the refractory may be placed exactly where desired without any chance of droppings further raising the bottom. Often it is helpful to wet this mixture slightly which aids in holding it in place along the sides. As soon as the hearth is completed it is given a light dusting of slag and heating continued until this has melted thoroughly and run into any small fissures or openings when the current may be shut off and the hearth is completed.

The electrodes are quickly knocked out of place and pulled from the furnace, and any spots under them carefully filled with magnesite, well rabbled into place. If the hearth has been well made, it should ring when a bar is thrust against it, and should be as hard as a wall of concrete. The greatest of care must be exercised during this burning, to avoid any undue overheating, tending to make either the roof or walls run, as this silicate running on to the hearth will prove a point of weakness.

One of the greatest sources of trouble in burning in a hearth is caused by a tendency to hurry. The result is that there will be points at different places in the hearth where the material has been only partly burned. The next layer probably will sinter well over this and will form a shelled spot, which to observation will look satisfactory, but upon any slight hole forming will result in an undermining often with disastrous results.

To make sure that there is no possibility of such an occurrence it is well to take frequent tests with the spoon from various points in the hearth, and not to proceed with further building until sure that each layer is perfectly sintered.

Compare Core Binders on Pound Basis

BY W. H. ALBOHN

FOUNDRYMEN frequently have occasion to note that they secure equally satisfactory results from the use of two materials of the same volume but of unequal weight. With this point in mind it is apparent that the lighter material is the cheaper of the two. In considering the question the following points are involved: quality of the resulting castings, volume of material used, adaptability of the material to the work in hand, price and weight. Usually foundry supplies are purchased by weight, but used by volume. For example blacking is bought by the pound but its value is measured by the surface area it will cover.

Two articles at different prices yielding identical results so far as casting quality is concerned always cannot be judged alone by price, not even if the volume used of each is identical. The weight of the volume involved is the factor to be considered. As a general rule foundrymen long have recognized these facts but with no equipment to test them out on an easy and practical basis have been content to slide along the line of least resistance so long as the castings came out satisfactorily.

The argument may be advanced that any saving effected will be so slight as not to warrant the effort involved. This may be true in the smaller shops where the monthly consumption of miscellaneous supplies does not amount to any great total. However, in the face of keen competition, even trifling savings are desirable. One method of saving is to teach the molder and coremaker to use the proper amount and no more. Teaching the buyer to purchase according to value gaged from every standpoint is another way to save. The following method for determining the relative values of dry materials is not absolutely accurate from a technical or laboratory standpoint but it will afford a foundryman a fair idea of the value of his materials.

The only equipment required is an ordinary flour sieve with a rotor attached, similar to that used in the kitchen, a 1-pint, a ¼-pint can or cup and a scale or balance that will weigh in grams. The entire outfit may be purchased for a small sum and usually may be counted on to pay for itself in a short time. Two pieces of 1-inch board 6 x 12 inches are nailed together at right angles to form a base and a support. The sieve is attached permanently to the upright support with the handle toward the right and at a sufficient height to provide a clearance of about 2 inches between the bottom of the sieve and the top of the cup. In using the device a sufficient quantity of the material to be tested is sieved though into the cup. It is struck off flush with the top of the cup and then weighed in comparison with other materials measured in the same manner. After making several tests the foundryman is in a position to form an intelligent opinion on the relative value of the materials.

Cupola Blast Pipe Area

Question: What diameter blast pipe would you recommend for a cupola 900 millimeters diameter inside the lining and using air at about 400 millimeters water pressure.

Answer: A pipe 14 inches diameter (355 millimeters) will deliver air satisfactorily to a cupola 900 millimeters in diameter (36 inches). Your blast pressure 400 millimeters (15¾ inches) is a little high and will have a tendency to oxidize the iron, particularly on the last charges.

Ben W. Boyer Jr., formerly sales engineer with the Union Special Machine Co., Chicago, now is connected with the New York branch of the Industrial works, Bay City, Mich.

British Show Marks Progress

Latest Developments in Foundry Equipment Displayed at Second Annual Show Held at Birmingham — American Designed Machines Prominent — Pneumatic Machines Shown in Operation

FOR THE second year in Great Britain the Chamber of Commerce of Birmingham achieved success in promoting and organizing an international exhibition of foundry trades, having the support of the Institution of British Foundrymen and of the British Cast Iron Research association. The first exhibition was held in June 1922 and the results justified the organization of this year's show. Furthermore, Birmingham is one of England's principal foundry districts; there being 828 foundries in the seven Midland counties, of which Birmingham is the center, and over 100 ferrous and nonferrous foundries in the city itself.

Representatives of foreign countries were on the executive committee: America being represented by H. Cole Estep, member of the committee on International relations of the American Foundrymen's Association; France by Emile Ramas, president of the Association Technique de Fonderie de France, and Belgium by J. Leonard, past president of the Association Technique de Fonderie de Belgique.

The show, which was held at Bingley Hall from June 19 to June 28, was opened by R. O. Patterson, president of the Institution of British Foundrymen. In his address, Mr. Patterson pointed out that exhibitions held each year in America greatly help to promote progress of mechanical devices applied to foundry practice and he expressed the hope that the same course would be followed in Great Britain and that the utilization of foundry machines on a larger scale would reduce costs and save skilled labor.

Many of the 85 exhibits were in operation, a power plant and compressed air station being installed in the hall to supply air for the various pneumatic machines. The exhibits included various types of molding machines, sand preparing devices, sand blast machines, core oils and various foundry accessories. Improvements in existing types of molding machines indicated a tendency toward more simple handling and careful construction.

Show Sand-Throwing Machine

One of the exhibits which attracted much attention was that of the Foundry Plant & Machinery, Ltd., Glasgow, manufacturers of sandslinging machines under the Beardsley-Piper patent. This machine was described in THE FOUNDRY, May 1, 1924. For the first time in Great Britain, two types of sandslingers were shown in operation. One was the tractor type which may ram molds containing from 2 to 50 cubic feet of sand. A portable sandslinger also was operated; this machine riddling and ramming sand at the rate of 7 to 10 cubic feet per minute.

The Adaptable Moulding Machine Co., Birmingham, England, specializing in pattern-drawing, hand-operated machines, displayed two rollover duplex machines. They each consist of two units operating independently of each other and mounted on the same pedestal. The load may be adjusted centrally, thus affording an even balance for rolling over, the latter operation being effected by star wheels. These machines permit the utilization of a double-sided pattern plate, mounted between adaptable brackets. In this case, a cope and a drag flask may be used simultaneously. The total draft is 12 inches. These machines also may be used for core making. The Adaptable company also showed a core machine for split core-boxes; a piston core machine, also for split core-boxes, with adjustable tables which may be raised or lowered according to the depths of the top and bottom parts of the core-box; a sand sifter; flask and snapflasks.

The Britannia Foundry Co., Ltd., Coventry, England, exhibited two jar-ramming machines with selfcontained

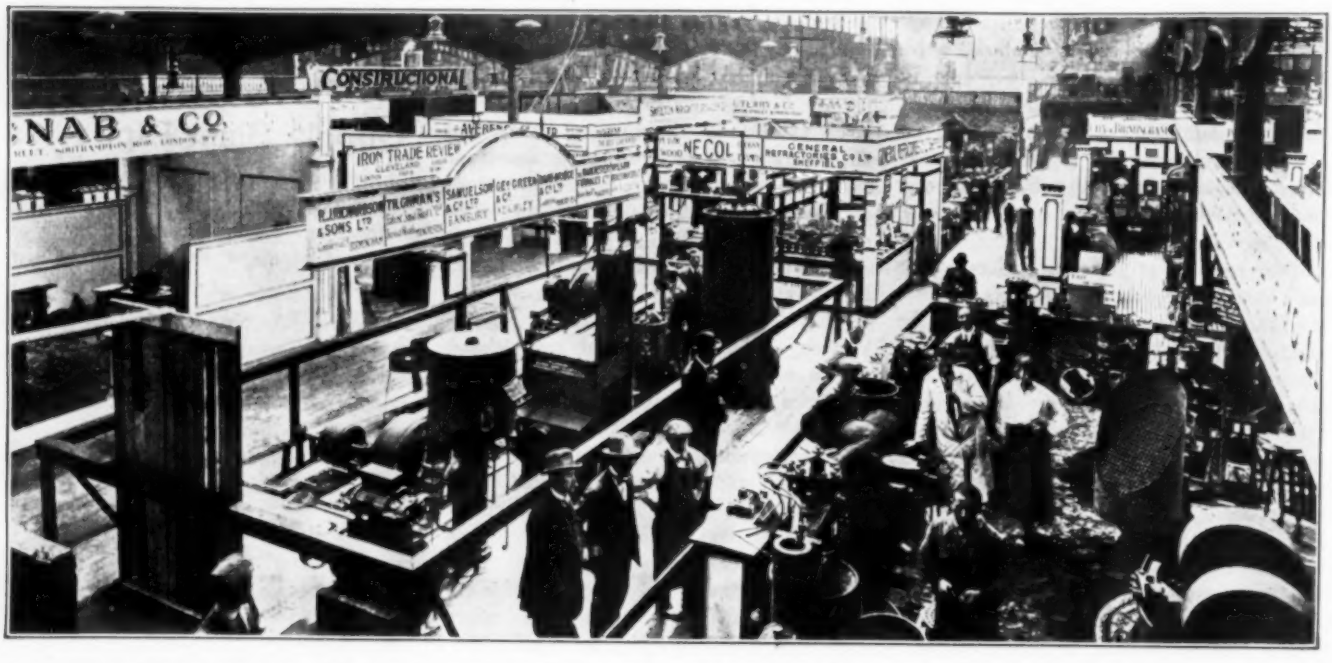


FIG. 1—A DISPLAY OF FOUNDRY MACHINERY FROM GREAT BRITAIN, AMERICA, FRANCE, AND OTHER COUNTRIES WAS SHOWN AT BINGLEY HALL

lifting apparatus which ram and lift molds up to 560 and 1120 pounds. That company manufactures machines up to two tons capacity. Two roll-over, jar-ramming machines and a jar-ramming, squeezer machine were displayed; as well as a patent hand operated head ramming machine for molds up to 14 x 16 inches with an 8-inch pattern draw. With a patent gear used on this machine, a pressure of five tons may be obtained on the mold. An adjustable hand-rammed molding machine also was shown, the machine being adjustable to flasks from 8 to 34 inches square with an 8-inch pattern draw.

Several molding machines manufactured by the Osborn Mfg. Co., Cleveland, were exhibited by J. W. Jackman & Co., Ltd., Manchester, England. This exhibit included a roll-over jolt machine to take flasks up to 36 inches square; a smaller machine for flasks up to 24 x 30 inches with the roll-over table made of a special aluminum alloy and which is swung by hand; a jolt squeezer and a jolt squeezer stripping-plate molding machine. Several machines of the Mumford type were shown including a split pattern jolt-squeeze machine in which the mold is jolted and squeezed, following which operation the finished mold is drawn from the pattern plate by two separate cylinders located diagonally to the table. A simpler squeezer machine for small work and a hand machine also were exhibited. Sand blast machines and cleaning chambers, sand mixers, core shop equipment, testing machines were displayed together with a ball cinder mill for securing the valuable metal from brass ashes, sweepings, skimmings, etc. in which the nonmetallic elements are broken up and reduced to powder.

Molding machines built under the American Tabor patents were displayed and operated by MacNab & Co., London, England. One machine, a squeezer bottom-ramming split pattern machine, was manufactured in America and exhibited for the first time in Great Britain. This machine enables cope and drag patterns to be molded in one flask. It is an adaptation of the split pattern machine used for symmetrical patterns, flat back work or patterns that may be split on a true plane, to which a bottom-ramming feature is added. One pattern plate is fixed on the table, the flask is placed over it and filled with sand, the head of the machine to which the second pattern plate is fixed is then brought over the flask which is squeezed to a definite pressure by a cylinder. The patterns are vibrated automatically; the table and the flask are withdrawn also automatically from the top pattern plate and the flask is then removed by hand from the bottom pattern plate. The flasks may be stacked on top of each other, ten flasks giving nine complete molds in which the pouring may be effected. Several types of machines were shown including a portable combination shockless jar-ramming roll-over pattern-drawing machine; a squeezer machine for light snapflask work; a shockless jar-ramming stripping plate machine and two plain jar-ramming machines.

The Pneulec Machine Co., Ltd., Smethwick, near Birmingham, England, displayed their improved electrically operated jar-ramming molding machine, the principle of which was described in THE FOUNDRY, July 15, 1922. The device which regulates the intensity of the jolt from a hard blow to a gentle tapping while the machine is in operation now is obtained by simply turning a thumb screw. The pattern drawing operation is mechanical. The lifting carriage which carries four arms and four lifting pins may slide on the outside of the cylinder; it is raised and lowered by a large diameter screw driven by reversing bevels and a dog clutch; this clutch is operated by a handle which is carried on a trip rod provided with adjustable collars for the automatic cut out of pattern drawing. The lift screw also is arranged with a safety clutch which, should the operation fail to unclamp the flask, will slip until the clutch is thrown out. Two handles control the whole operation of the machine. Its capacity runs from 100 to 1440 pounds. The oil sand mixer manufactured by the Pneulec Machine Co. consists of a cast iron body divided into two compartments in each of which runs a shaft upon which are mounted impellor screws. When the mixer is in operation the sand constantly moves round the body, the propeller conveying it from one end to the other, and a paddle then throwing the sand from the end of one compartment into the other. The sand may be discharged automatically through a door at the bottom of one of the compartments. This exhibit also included a portable electric riddle, a swing grinder which may be slung from a crane or mounted on a portable trolley, and special core oils.

Exhibit Molding Machines

The molding machines manufactured by Ph. Bonvillain & E. Ronceray, Choisy-le-Roi, near Paris, France, were displayed and operated by the Universal System of Machine Moulding & Machinery Co., Ltd., formed by Bonvillain & Ronceray in London, England. The pattern plates and stripping plates which were used at the exhibition were made in metal without any machining, the pattern being one of the new British standard axle boxes. Bonvillain & Ronceray displayed a high speed double ramming boxless machine with several other types of standard machines, a small oil sand mixer, the self-emptying sand mill which was exhibited for the first time in Paris in September 1923 and various hydraulic devices.

Other exhibits indicated the association with America in various ways. Among these one of the most effective displays was that of the Sterling Foundry Specialities, Ltd. of Bedford. That company showed a variety of rolled steel molding boxes of American design suitable for iron, brass, steel and aluminum foundries. Twenty different standard styles of boxes were shown to meet all requirements. The English company has the right of manufacture from the Sterling Wheelbarrow Co., Milwaukee.

The type of conveyor made by the Mathews Conveyor Co., Elwood City, Pa., is another American device in favor in Great Britain and was shown on the special stand by W. & C. Pantin, Upper Thames Street, London. A number of the leading steelworks and foundries have this in operation.

The Constructional Engineering Co., Ltd. displayed an improved type belted cupolette fitted with a patent blast control arrangement and other improvements. The plant has a melting capacity of 3,360 pounds of metal per hour. Other items of foundry equipment included sand riddles, ladles, molding boxes, tramps, etc.

John Macdonald & Co., Glasgow, pneumatic engineers, gave prominence to the specialities of the Berkshire Mfg. Co., Cleveland, showing examples of the air squeezers, automatic molding machines, pneumatic grinders, drilling machines, etc.

In the furnace department Smeeton-Wright Furnace Ltd., London, showed the Chantraine patent multiflame recuperative gas-fired furnaces for melting, reheating and annealing metals. Their foundry ladles are said to afford steadiness and continuity of pouring, whether the ladle is full or nearly empty. Hand jolt-ram molding machines were shown by John M. Terry & Co. of Birmingham. A saving is said to be effected by dispensing with the power plant.

The Avebene Co., Ltd., gave prominence to a core and mold sand binder. The device is designed to handle special difficulties encountered in the casting of brass, bronze, iron and steel. The exhibit included a number of cores for various component parts used in the cycle and motor trades.

As one of the leading promoters of the exhibition, the British Cast Iron Research association had a porminent ex-

hibit. This organization now is making good progress with a membership of 275, representing all branches of the foundry trade in all districts. Mr. Pearce, the director was in charge of the booth with the co-operation of J. E. Fletcher, the consultant. A useful works device for grading sand by the water permeation method was displayed and as showing the practical work done, a list of researches planned for this and next year, was displayed dealing with such subjects as erosion and corrosion resisting cast iron, molding sand, automobile cylinders and pistons, graphitization of cast iron, production of malleable cast iron, cupola practice, standardization of test bars, methods and materials, etc.

Specimens of furnaces were shown by the Selas-Turner Co., Ltd., of Manchester. These furnaces are fired by Selas gas which it is said ensures perfect combustion and excellent control and efficiency. The furnace is fitted with an artificial corundum hearth made by the Carborundum Co., Niagara Falls, N. Y. Other products shown by that company were blow pipes and lamps.

The industrial research laboratory of the City of Birmingham gas department showed various forms of testing apparatus devised by the department with types of furnaces considered specially useful for gas heating. The department has made great progress in the introduction of modern appliances at various Birmingham works.

A special fire cement, made by Thomas E. Gray & Co., London was displayed at their booth. That company showed ganister parting powder, cement and other necessaries for the foundry.

Ritchie, Hart & Co., Ltd., Belfast, exhibited a loam core-making machine, enabling control to be effected by means of the foot, leaving the hands free. A number of loam cores ranging from 1½ inches to 18 inches in diameter up to 13 feet long were shown although much larger ones are made. A popular exhibit by this firm was the foundry floor dresser for cleaning up the foundry after the day's work.

Metallographic apparatus shown by F. Davidson & Co., Ltd., London, included a metal works camera designed by Dr. F. Rogers, president of the Sheffield Metallurgical association. In this apparatus, the specimen rests on a platform and fixed magnification is given up to 500, photographs, it is said, being obtained at the rate of 110 per hour.

A number of firms specialized on foundry molding sands. The high quality of Birmingham sand has had much to do with the large concentration of the foundry industry in that area. Specimens of this sand were shown by John Williams Ltd., of the Foundry Sand Quarries, Birmingham. Yorkshire molding sands with specimens of core binder and facing flour were shown in great variety by the Yorkshire Amalgamated Products Ltd., Doncaster, which also has produced silica bricks and insulating bricks for open-hearth and electric furnaces. A special sand was shown for use in the manufacture of light castings.

A rust resisting device was shown by the Atlas Preservative Co., Ltd., London, the special merit of which, it is claimed, is that it absorbs and neutralizes the rust particles, thus preventing further formation underneath the covering. The makers consider it is specially resistant to acid fumes and high temperature. W. T. Nicholson & Clipper Co., Ltd., Manchester, showed a leather belt lacing machine. Belt cutting shears and file and tool handles and vice tools also were displayed.

The modern necessity of refractories for resisting high temperatures has led to the production by the General Refractories Co. Ltd., of Sheffield of magnesite and chrome bricks which were on display. Special sands for foundry requirements also were exhibited. Air compressors were shown by R. J. Richardson & Sons, Ltd., Birmingham.

Several firms such as Bradley & Foster, Ltd., Darlaston and the Shotts Iron Co. Ltd., Edinburgh, exhibited specimens of foundry iron showing low

RUNDUM Co LTD TRAFFORD PARK MANCHESTER
AND AGENTS:- RICHARD LLOYD & Co LTD STEELHOUSE LANE BIRMINGHAM
46
STERLING FOUNDRY SPECIALTI

FIG. 2—ABRASIVE WHEELS AND REFRACTORIES WERE EXHIBITED WITH VARIOUS FOUNDRY ACCESSORIES

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TYPICAL ANALYSES OF MISCELLANEOUS COMMODITIES USED IN FOUNDRY PRACTICE

By J. M. Quinn

(Continued from Data Sheet No. 532)

Commodity	Name Symbol	Nickel Ni	Carbon C	Manganese Mn	Sulphur S	Phosphorus P	Silicon Si	Iron Fe	Aluminum Al	Copper Cu	Arsenic As	Calcium Ca	Tin Sn	Source of Data
ALLOYS—(Continued)														**ALLOYS—(Continued)**
Phosphorus—Ferro			1.17	0.70	0.046	21.40	1.63	75.03						Iron & Steel by H. P. Tieman — 1910
Phosphorus—Ferro			0.10 to 0.20	0.15 to 0.25		17.00 to 24.00	0.07 to 0.25	75.00 to 80.00						Hickman-Williams & Co., Chicago — 1918
Silicon—10% Ferro			1.50	1.35		0.060	11.50							Blast Furnace Products, Illinois Steel Co., Chicago — 1909
Silicon—50% Ferro			0.55	0.02	0.018	0.075	49.90							Iron & Steel by H. P. Tieman — 1910
Silicon—75% Ferro			0.40	0.13		0.022	75.16							Interstate Iron & Steel Co., Chicago — 1920
Silicon—Ferro, Grade No. 1			0.27	0.31		0.050	32.70		0.13					Electric Furnace Product, Illinois Steel Co., Chicago — 1909
Silicon—Ferro, Grade No. 2			0.09	0.13		0.040	48.70		0.17					Electric Furnace Product, Illinois Steel Co., Chicago — 1909
Silicon—Ferro, Grade No. 3				0.09		0.020	75.80		0.08					Electric Furnace Product, Illinois Steel Co., Chicago — 1909
Silicon—Ferro, Grade No. 4				0.08		0.010	94.80		0.10					Electric Furnace Product, Illinois Steel Co., Chicago — 1909
Silicon—Ferro Manganese			0.30	74.20			24.70	0.80						Electric Furnace Product, Illinois Steel Co., Chicago — 1909
Silicon—Ferro Nickel		30.00		0.90		0.020	47.20	15.68	2.90	2.58		0.15		Report of Royal Ontario Nickel Commission, Toronto, Canada — 1917
Silicon—Ferro Nickel			1.00 to 2.00	65.00 to 70.00			20.00 to 25.00	3.00 to 5.00						Electro Metallurgical Sales Corp., New York — 1922
Silicon—Ferro Spiegel			1.26	20.32		0.070	10.33	68.02						Blast Furnace Product, Tieman, Iron & Steel — 1910
Silicon—Ferro Spiegel			1.39	20.87		0.100	14.23	63.41						Blast Furnace Product, Illinois Steel Co., Chicago — 1909
Silicon—Ferro Spiegel			1.45	20.50		0.070	9.45	68.53						Blast Furnace Product, Illinois Steel Co., Chicago — 1909
Spiegeleisen			5.18	20.50	0.002	0.055	0.76	73.61						Iron & Steel by H. P. Tieman — 1910
Spiegeleisen			5.00 to 7.00	19.00 to 21.00	Under 0.750	Under 0.100	0.75 to 1.00	72.00 to 76.00						Hickman-Williams & Co., Chicago — 1918
Spiegeleisen			4.83	18.83	0.017	0.238	1.52							Interstate Iron & Steel Co., Chicago — 1920
Tungsten—Ferro	Tungsten W	79.48	1.49	0.21	0.016	0.017	0.16	18.60	0.001					C. W. Leavitt & Co. Product, Illinois Steel Co., Chicago — 1909
Tungsten—Ferro		73.00	3.50	3.50	0.050	0.030	0.40	19.00			0.40	Trace	0.10	Bureau of Mines, Bulletin 77, Washington — 1916
Tungsten—Ferro		83.00	0.60	0.20	0.040	0.015	0.40	15.50			0.10	0.15	0.05	Bureau of Mines, Bulletin 77, Washington — 1916
Tungsten—Ferro		81.25	0.09		0.016	0.035								de Courcy Browne, New York — 1920
Tungsten—Ferro		80.96	0.73	0.50	0.033	0.022	0.54			0.02	0.17		Trace	International Ores & Metals Selling Corp., New York — 1922
Tungsten—Ferro		80.17	0.49	0.21	0.044	0.024	0.36			0.04	0.26		Trace	International Ores & Metals Selling Corp., New York — 1922
	Name Symbol	Vanadium Va	C	Mn	S	P	Si	Fe	Al	Cu	Uranium U			
Uranium—Ferro			4.00 to 5.00				4.00				25.00 to 35.00			Foote Mineral Co., Philadelphia — 1920
Uranium—Ferro			Under 0.25	Under 1.00	Under 0.20	Under 0.100	Under 0.100	Under 2.00		Under 0.15	Under 0.05	Under 30.00 to 40.00		Standard Alloys Co., Pittsburgh — 1921
Vanadium—Ferro		52.80	1.04		0.025	0.020	0.09	45.84		0.09				C. W. Leavitt & Co. Product, Illinois Steel Co., Chicago — 1909
Vanadium—Ferro		34.10	1.42		0.030	0.009	0.12	64.22						C. W. Leavitt & Co. Product, Illinois Steel Co., Chicago — 1909
Vanadium—Ferro		31.48	0.08	0.28			0.13							C. W. Leavitt & Co. Product, Illinois Steel Co., Chicago — 1909
Vanadium—Ferro		55.00	4.00	0.30	0.030	0.040	0.30	40.00	0.10					Bureau of Mines, Bulletin 77, Washington — 1916
Vanadium—Ferro		34.10	1.42	0.12	0.030	0.009	0.12	64.10	0.12					Bureau of Mines, Bulletin 77, Washington — 1916
Vanadium—Ferro		36.60	0.72				3.46							Standard Alloys Co. Product, Interstate Iron & Steel Co., Chicago — 1919
Vanadium—Ferro		35.93	0.60				2.20							Standard Alloys Co. Product, Interstate Iron & Steel Co., Chicago — 1919
Vanadium—Ferro		32.75	1.30				16.55							American Vanadium Co. Product, Interstate Iron & Steel Co., Chicago — 1919
Vanadium—Ferro		37.50	0.71				2.40							American Vanadium Co. Product, Interstate Iron & Steel Co., Chicago — 1919
Vanadium—Ferro		39.53	0.20		0.280	0.037	1.92		3.52					Vanadium Corp. of America, New York — 1921
Vanadium—Ferro		35.00 to 40.00	0.50		0.050	0.050	0.50 to 2.00							Metal & Thermit Corp., New York — 1920

(Continued on Data Sheet No. 535)

Do not cut—Fold along this line for binding

Note—This sheet may be cut along this line and one half folded over on the other to bind in 5 x 7 inch note book.

THE FOUNDRY DATA SHEET, JULY 15, 1924

Payment will be made for all contributions on foundry and pattern shop practice suitable for publication

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THE PORTAGE SILICA COMPANY

SILICA MOLDING AND SAND BLAST SAND

602 STAMBAUGH BUILDING

J. G. BUTLER, JR., PRES. AND TREAS.
E. E. KLOOZ, VICE PRES. AND GEN. MGR.
J. B. CHAMBERS, VICE PRESIDENT
L. R. FARRELL, SECRETARY

ADDRESS ALL COMMUNICATIONS
TO THE COMPANY

WORKS NEAR
PHALANX, OHIO

PHONES
BELL, MAIN 684
AUTOMATIC 5226

YOUNGSTOWN, OHIO June 14, 1923.

The Foundry,
Cleveland, Ohio.

Attention: Mr. J. D. Pease, Director Advertising Sales

Gentlemen:

The recent American Foundrymen's Convention and Exhibition has strengthened our conviction of the value of advertising in The Foundry. It seems that everyone connected with the foundry trade, with whom we came in contact, was familiar with our operations and products. We attribute thiscondition to our continuous advertising in The Foundry.

When we started our advertising campaign in 1911, our product was just being placed on the market, and the steady growth has been in a large measure due to this campaign. We therefore can come to only one conclusion, and that is that The Foundry is the best medium to bring products such as ours to the attention of the consumer.

We also wish to emphasize our appreciation of the hearty co-operation which we have always received from your staff.

Yours sincerely,

THE PORTAGE SILICA CO.

E E Klooz

EEK:F GENERAL MANAGER

sulphur and phosphorus contents. Among a variety of ingenious weighing and testing machines, W. & T. Avery Ltd., Birmingham gave prominence to their transverse tester for cast iron bars for testing the breaking strength and deflection. Some specimens of revolving brushes for speedy cleaning of castings were shown by Canning & Co. Ltd., Birmingham.

Two large stands were occupied by the Carborundum Co. Ltd., Manchester, England, which manufactures grinding wheels applicable to cast iron, chilled iron, brass, phosphor bronze and unannealed malleable. A speciality was a wheel designed for the grinding of aluminum.

Spermolin Ltd., Halifax, have adapted their product for coremaking to various foundry requirements, five special brands being exhibited. The company which has a large export trade in machines as well as their mixing products, exhibited rotary core machine and sand mixing and milling machine.

The nonferrous department was well represented by T. J. Priestman of the Cupro Foundry, Birmingham, showing a variety of special alloys in aluminum, brass, gunmetal, phosphor bronze, nickel and zinc.

In the foundry plant section Samuelson & Co., Ltd., Banbury, showed good specimens of the latest types of blowers and plate molding machines for repetition foundry work.

During the exhibition, the following papers were read in the Lecture Room: "A Comment upon the Methods of Judging and Mixing Pig Iron" by Horace J. Young; "Experimental Study of Different Systems of Ramming Sand" by E. Ronceray; "Economy in Foundry Practice," by E. Harwood Brown; "The Problem of the Liquid Contraction of Gray Cast Iron" by Robert Buchanan, past president of the Intsitution of British Foundrymen; "Porosity in Cast Iron" by Arthur Marks. The competitions on core making, molding and pattern making were followed by many foundry employes and students and great enthusiasm was shown by those entering the contest.

FIG. 3—MANY TYPES OF MOLDING MACHINES WERE SHOWN IN OPERATION AT THE EXHIBITION

Cores Prevent Hazard in Gas Stove Burner

Question: We are starting to manufacture gas stoves and are experiencing considerable trouble with the burner castings. Apparently the cores are responsible. We shall appreciate any information you can give us on how this problem is handled in other foundries. Is it customary to make any additions to the iron in the ladle before pouring these castings.

Answer: On account of the comparatively large area of the core and the single opening through which all the gas has to escape during the pouring process, it is essential that the core shall be extremely porous and made from a mixture that will develop a minimum amount of gas. Sharp sand which is known under many local names, beach sand, sea sand, etc., bonded with an oil binder is employed practically exclusively in cores of this character. The cores are made in two-part metal coreboxes. The sand is pressed by hand into each half, then the two halves are brought together after which one half box is removed and replaced by a metal form. The core then is inverted and the other half of the box is removed. The metal form supporting the core then is placed in the oven and the core is dried until it turns brown and begins to smoke. Small tin chaplets, usually known as radiator chaplets, are employed to support the core in the mold. In stove plate foundries and other shops where these castings usually are made, the iron is caught in hand ladles directly under the cupola spout and poured into the molds without further addition or manipulation. With the single exception, of course, that a pinch of sand may be thrown on the surface to hold the slag and prevent it from flowing.

According to a report of the United States department of commerce for the census of manufacturers, 1923, the establishments engaged primarily in the manufacture of graphite and clay crucibles, retorts and glass house pots during the past year reported products manufactured valued at $3,476,816 as compared with $1,969,930 in 1921, or a gain of 76 per cent. The value of graphite crucibles and retorts produced in 1923 was $2,312,739 and the value of such products as fire brick, tile, refractory cements, etc. as $523,613.

Society Studies Cast Metals

Consideration of Points Relating to Physical Properties of Metals and Alloys by American Society for Testing Materials Carries Much of Interest for Foundries

AMONG the varied subjects of interest to foundrymen considered at the twenty-seventh annual meeting of the American Society for Testing Materials held at Atlantic City, June 23-27, were cast-iron pipe, corrosion and heat resistant alloys, heat treating and investigations of sulphur and phosphorus effects.

Recent development in the cast-iron pipe industry has brought the testing of this material into prominence. The desire for pipe made of more resilient metal has led the engineer to seek more exacting specifications governing this product and in consequence the chemical and physical tests called for in existing standard specifications are being studied. Recently the broad program of standardization under the American engineering standards committee has made it particularly opportune to arrange for a general discussion of the material involved.

Considerable interest was evidenced in a group of papers and reports on cast iron pipe presented at the closing meeting on Friday night. Recent developments in manufacturing methods comprising metal or sand mold centrifugally cast pipe have introduced new problems, and users through such organizations as the American Waterworks association and the American Gas association have requested the formation of a sectional committee to investigate methods of testing with a view to possible changes in the specifications for cast iron pipe, soil pipe and fittings.

One of the important subjects discussed was that of the resistance of metals and alloys to corrosion. Reports were read covering the results of experiments carried out in accelerated tests on metals. Discussions questioned the value of accelerated tests when compared with long time tests owing to the discrepancy in the results obtained under the two types of tests.

At the Wednesday night session the election of the following officers of the society was announced. President, F. M. Farmer, Electrical Testing laboratories, New York; vice president, J. H. Gibboney, Norfolk and Western railway, Roanoke, Va.; members of the executive committee, William Campbell, Columbia university, New York; A. E. Jury, United States Rubber Co., New York; Anson Marston, Iowa State college, Ames, Ia., and John A. Mathews, Crucible Steel Co. of America, New York.

This meeting was the second in point of attendance in the society's history, a total registration of 966 being reported at the closing session. Special entertainment features were in charge of a committee headed by W. M. Course, National Research council, Washington. M. M. Upson, Raymond Concrete Tile Co., New York, was awarded the silver cup and gold medal as A. S. T. M. golf champion, while prizes for low net scores were awarded to J. H. Chubb, Universal Portland Cement Co., Chicago; J. H. Young, Mellon Institute of Industrial Research, Pittsburgh, and A. F. Braid, Metal and Thermit Corp., New York. A. G Blakely, Philadelphia & Reading Coal & Iron Co., Pottsville, Pa., won the tennis tournament, with L. P. Nemzek, E. I. Du Pont de Nemours & Co., Philadelphia, runner up.

Scan Resistance Properties of Metals

A SYMPOSIUM on corrosion-resisting and electrical-resistance alloys featured the first session of the twenty-seventh meeting of the American Society for Testing Materials held at the Chalfont-Haddon Hall, Tuesday morning, June 24. The symposium had been arranged by the following committee acting in an advisory capacity to the committee on papers: Jerome Strauss, chief chemist United States naval gun factory, Washington, D. C., chairman, P. A. E. Armstrong, vice president, Ludlum Steel Co., Watervliet, N. Y., W. H. Bassett, technical superintendent, American Brass Co., Waterbury, Conn., L. O. Hart, A. G. Krynitsky, associate physicist, division of metallurgy, United States bureau of standards, Mt. Rainer, Md., P. D. Merica, director of research, International Nickel Co., New York, N. Y., and H. M. Williams, metallurgist, General Motors Research Corp., Dayton Ohio.

As an introduction to the symposium, Jerome Strauss, chairman of the committee, presented a tabulation of manufacturers data on the composition and properties of the alloys in general which were submitted by the various manufacturers. The chairman explained that such a tabulation would be of great benefit as a guide to engineers and users of such products in the correct selection of metals for specific uses.

A paper by P. A. E. Armstrong, vice president, Ludlum Steel Co., Watervliet, N. Y., reviewed metallurgical developments that have produced the chromium bearing alloys. The author explained that corrosion-resisting metals of the past were nonferrous. Bronze and copper alloys generally antedated ferrous alloys. However, evidence has been obtained which demonstrates that iron and steel were known many years prior to their supposed date of origin. At this present age, iron with high percentages of chromium are the typical rustless irons. The author explained that the heat-resisting characteristics of chrome-silicon irons with high or low carbons are well recognized and at present are used extensively.

A paper by R. J. Anderson, Boston, Mass. and G. M. Enos pointed to the importance of the corrosion problem to the coal mining industry. The nature of acid mine water from coal mines was discussed at this time and that such water caused corrosion in the major part due to the presence of free sulphuric acid. On the basis of a great number of tests, a list of materials which are resistant to acid mine waters was offered and the applicability of such materials to the construction of mining equipment noted.

Nonrusting, chromium-nickel steels were outlined by B. Strauss. He described the valuable properties of chromium as an alloy with iron and steel. The results of corrosion tests on the chrome-nickel alloys were discussed and a number of diagrams shown demonstrating the change of elonga-

tion at advanced temperatures of highly alloyed chromium-nickel steels, and soft steels, together with various micrographs showing the different structures.

A paper prepared jointly by Jerome Strauss, material engineer and J. W. Talley, assistant chemist United States naval gun factory Washington, set forth tests for the determination of the physical characteristics, and behavior of approximately 30 commercial corrosion-resistant steels in over 20 distinct compositions when subjected to sea water spray. Observations concerning their behavior in tension, hardness, impact and salt-spray corrosion testing were made on samples subjected to a variety of heat treatments.

The materials used for test purposes were arranged arbitrarily in three group as follows: Hardenable chromium steels; chromium steels that do not harden; steels in which the predominating alloying element is nickel.

Continuing the symposium on resistance of alloys to corrosion, heat and electrical currents at the evening session with G. K. Burgess, president Massachusetts Institute of Technology and past president of the A. S. T. M. presiding, F. A. Fahrenwald, Cleveland, defined the various properties grouped under the general heading of heat resistant. Much so-called heat resistance in fact is oxidation resistance. He stated that chromium, the element usually present in alloys of this classification, is readily oxidized, but in this state, it forms an effect shield against further inroads, and becomes in fact resistant. The commoner forms of heat resisting metals contain chromium, nickel, or cobalt. He compared the action of ferrous metals under steadily rising temperature to copper, aluminum, lead and mercury, stating that the physical properties of each of the latter are assumed in turn by the iron or steel subjected to higher temperatures. The elastic limit and yield point are not present as the melting point is approached.

M. A. Hunter, Driver-Harris Co., Newark, N. J. traced the development of high resistance alloys under stimulus of increased interest in electrical heating. He classified these alloys according to their adaptability for use under various ranges of temperature, outlining them on a basis of their nickel content, and giving tables and graphs illustrating their chemical and working temperature characteristics.

A study of all conditions which must be met by alloys destined for high temperature-pressure duties was presented by C. E. MacQuigg, Union Carbide and Carbon Research laboratories, Long Island City, N. Y. The desirable properties of such alloys are good casting qualities, machineability, forgeability, immunity to destructive agencies and strength. Alloys of iron and chromium are favored because of their cheapness and their ability to meet these requirements. Particular reference was made by Mr. MacQuigg to an alloy of from 25 to 30 per cent chromium, fractional percentages of silicon and manganese and the remainder iron. Excellent machineable castings may be made from alloys containing up to 1.5 per cent carbon and above this amount the castings require heat treatment. Chromium results in a less fluid metal and over 20 per cent chromium imports a creamy consistency to the melted metal making it difficult to cast. Higher carbon reduces this effect. Castings made from chromium bearing metal vary in tensile strength from 65,000 to 90,000 pounds per square inch. With 2.75 per cent carbon the brinell hardness reaches 550 to 600 in sand cast alloys, and brittleness encountered in white iron is entirely absent. The reason for this property was explained through micrographs.

Submit New Nonferrous Specifications

AT THE session held Wednesday morning June 25, G. H. Clamer, past president of the A. S. T. M. and president of the American Foundrymen's association, presiding, an interesting discussion arose as to the value of accelerated tests on corrosion of metals. It was the general opinion that the long time gives the more reliable data although the accelerated tests have a definite value in preliminary work.

Report of committee B-2 on nonferrous metals and alloys was presented by William Campbell, professor of metallurgy, Columbia university, New York, which embodied reports on high strength light alloys such as aluminum alloys, effects of impurities in babbitt metals, and commercial sizes of lead pipe, submitting specifications for Muntz metal condenser tubes, brass condenser tubes, manganese bronze castings, phosphor tin, phosphor copper and silicon copper. This committee recommended revisions of specifications covering admiralty condenser tubes, for Lake and electroyltic copper, and for manganese bronze ingots.

The report of committee E-4, read by W. H. Bassett, American Brass Co, Waterbury Conn. showed that the members were unanimously of the opinion that photography should not be considered as a part of metallographic testing, but only as a means of making a record of the tests. This committee recommended for advancement to standard, methods for metallographic testing of iron, steel and nonferrous metals, and alloys together with practice for photography as applied to metallography and revised definitions of terms used relating to metallography. A critical bibliography of etching methods was covered in this report.

Report of committee B-3 on corrosion of nonferrous metals and alloys was presented by the chairman, E. C. Lathrop, Samuel P. Sadtler and Sons, Inc., Philadelphia, covering the methods which will be used for the total immersion, alternate immersion, spray, and accelerated, electrolytic corrosion tests of nickel, zinc, lead, copper, aluminum, and admiralty metal. The materials and solutions to be used were fully described.

An interesting paper prepared by H. S. Rawdon, A. I. Krynitsky, bureau of standards, Washington, D. C., and W. H. Finkeldey, New Jersey Zinc Co., Palmerton, Pa., described the various types of apparatus for carrying out simple immersion tests; repeated immersion tests; interrupted repeated immersion-tests in which the specimen is permitted to dry between two successive immersions, tests in which the specimen is exposed to the spray of the corrosive medium, and tests consisting of a combination of a series of exposures, the entire cycle simulating ordinary weather conditions. The apparatus used in conducting these tests were shown by numerous illustrations.

This session proved of great interest to the members present owing to the animated discussions that folowed the reading of the reports of the several commitees. F. N. Speller, National Tube Co., discussed the limitations of the accelerated tests and advised their classification into distinct groups so as to eliminate expense and simplify results.

Harry Y. Carson, American Cast Iron Pipe Co., Birmingham, Ala., brought up the point that there should be similarity between the results ob-

Proposed Tentative Specifications for Manganese-Bronze Castings

Issued at Atlantic City, June 25, 1924

Material Covered

1. These specifications cover castings made from the copper-zinc alloy known commercially as manganese bronze.

I. Manufactured

Material Used

2. Material used in these castings shall conform to the requirements of the tentative specifications for manganese-bronze ingots for sand castings, serial designation: B 7—24 T of the American Society for Testing Materials.[3] At least 35 per cent of the mixture shall consist of ingots manufactured in accordance with the tentative specifications for manganese-bronze ingots and the remainder shall consist of risers, sprues, and defective castings, accruing from the manufacture of castings in accordance with these specifications. Zinc additions shall be of zinc conforming to the requirements of Grade 2 or better of the standard specifications for spelter, serial designation: B 6, of the American Society for Testing Materials.[3]

II. Chemical Properties

Chemical Composition

3. The bronze shall conform to the following requirements as to chemical composition:

	Maximum	Minimum
Copper, per cent	60	55
Zinc, per cent	42	38
Tin, per cent	1.5	0.0
Manganese, per cent	3.5	0.0
Aluminum, per cent	1.5	0.0
Iron, per cent	2	0.0
Lead, per cent	0.4	0.0

III. Physical Properties and Tests

Tension Tests

4. The bronze should conform to the following minimum requirements as to tensile properties:

Tensile strength .....65,000 pounds per square inch
Elongation in 2 inches .....25 per cent

5. (*a*) The tension test specimen shall be machined from coupons to the dimensions as shown in Fig. 1.

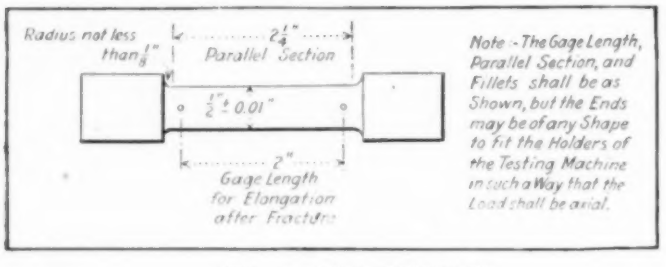

Radius not less than 1/8"
2 1/4"
Parallel Section
1/2" ± 0.01"
2"
Gage Length for Elongation after Fracture
Note - The Gage Length, Parallel Section, and Fillets shall be as Shown, but the Ends may be of any Shape to fit the Holders of the Testing Machine in such a Way that the Load shall be axial.

FIG. 1—TEST SPECIMEN

[1]Criticisms of these tentative specifications are solicited and should be directed to P. D. Merica, secretary of committee B-2 on Nonferrous Metals and Alloys, International Nickel Co., 67 Wall street, New York.
[2]See p. 41.
[3]1921 Book of A. S. T. M. Standards.
[4]It was not found possible to include the figure showing the coupon in the society's preprint.

(*b*) The coupon attached to the castings shall be in accordance with Fig. 2[4], unless special authority to use coupons of other forms and dimensions is obtained from the purchaser.

(*c*) Each casting weighing 250 pounds or more as delivered from the foundry shall have at least two test coupons cast attached.

(*d*) When the castings constituting a heat weigh less than 250 pounds each, one coupon shall be cast attached to the first and one to the last casting poured in each heat.

(*e*) Castings which are too small to permit the casting of a coupon attached shall, when possible, be represented by coupons cast in the same flask and gated to the castings or runners. One coupon shall be cast gated to the first and one to the last casting poured in the heat.

(*f*) Only in cases when it is impossible to cast coupons in the same flask with small castings shall such coupons be cast separately. In case it is necessary to cast coupons separately, one coupon shall be cast to the first of the heats and one to the last.

(*g*) At least two ounces of drillings from each coupon tested shall be forwarded for chemical analysis.

IV. Marking

Marking

6. Each casting shall be clearly stamped with the heat number, and the heat number shall also be stamped on the test coupon representing that heat.

V. Inspection and Rejection

Inspection

7. (*a*) Inspection may be made at the manufacturer's works where the castings are made or at the point at which they are received at the option of the purchaser.

(*b*) If the purchaser elects to have inspection made at the manufacturer's works, the inspector representing the purchaser shall have free entry, at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the manufacture of the material ordered. The manufacturer shall afford the inspector, without charge, all reasonable facilities to satisfy him that the material is being furnished in accordance with these specifications. All tests and inspection shall be so conducted as not to interfere unnecessarily with the operation of the works.

Rejection

8. (*a*) Any casting may be rejected upon the failure of the test coupon to meet the physical requirements specified or for the noncompliance with the chemical composition. If the physical or chemical tests indicate that the heat of castings represented by its test coupon does not conform to the physical or chemical requirements, or both, the entire heat shall be rejected.

(*b*) In case tests on the first test piece do not conform to these specifications, a second test piece shall be tested. If such a test on the second piece is thoroughly satisfactory the castings or heat shall be accepted; if unsatisfactory, the castings or heat shall be rejected.

tained by the accelerated tests and the long time tests, otherwise the accelerated tests would be of little value in determining the merits of different materials in resisting the action of the various solutions, acid and alkaline, on the metals and alloys submitted to the different tests.

Present Sulphur Views

SULPHUR and its effect upon physical properties, a theme of recurrent interest at meetings of the society, was brought forward at the Thursday morning session. The report of the joint committee made up of representatives of the bureau of standards, A. S. T. M., the national research council, Association of American Steel Manufacturers, Steel Founders Society of America, American Foundrymen's association and other interested groups, was presented in several sections. A resume by Chairman Burgess of the work of this committee was the third preliminary report presented and gave a summary of progress made to date.

Further material on the metallographic investigation of the effect of sulphur on rivet steel was offered and a preliminary report on an investigation of sulphur effect on structural steel was presented.

In the discussion which followed, E. E. Thum, *Chemical and Metallurgical Engineering*, New York, suggested that the user is indifferent to sulphur as

long as physical tests are satisfactory. Further he said that poor results may come from carelessness in steel making, and that an examination of the literature on the effects of sulphur indicates other deleterious agents are present which perhaps are not as easily evaluated as is sulphur. He advised a study of manufacturers' methods, a plotting of physical tests against manganese, carbon and perhaps manganese plus sulphur. He doubted the value of sulphur prints in showing sulphur and defined the sulphur study as a test of methods of testing as much as a determination of final results.

The report of committee A-1 on steel, offered by F. M. Waring, chairman, and embodying revisions in steel pipe, rails, rivet steel, carbon-steel wheels, boiler tubes, steel castings and structural steel for various purposes was presented.

Great interest was aroused by a paper by Thomas H. Wiggin, New York, on the need of the small user for the benefit of the standardization work of the society. Mr. Wiggin pointed out that the large consumer of engineering materials may insist upon compliance with specifications on the part of the manufacturer. This privilege in many cases is denied to the buyer of small lots. He cited instances of materials rejected on test by the large customer, being sold in small lots to lesser individual users. He advised a more constant recognition and emphasis by both producers and consumers of the standards set up after deliberation of the A. S. T. M. and the more general adoption of short designations for marking goods after individual tests to show them to be of the grade sought and specified by standard classifications.

A paper by John Howe Hall and C. R. Hanks which will be published in an early issue of THE FOUNDRY, outlined the average composition of manganese steel, set forth the limits for various metalloids, and gave a summary of the steel making methods employed in foundries making manganese steel castings. Suggestions were offered for proper heat treatment of this product and the physical properties were specified.

A proposed revised tentative recommended practice for the heat treatment of carbon-steel castings was presented by committee A-4. In presenting this report, John Howe Hall, secretary, mentioned the appointed of new subcommittees on the heat treatment of gray cast iron and malleable iron.

Report of committee A-7 on malleable castings, Enrique Touceda, secretary, was read by W. P. Putman, Detroit Testing Laboratory, Detroit. This was a general progress report in which the committee recommended the advancement to standard of tentative revisions in the specifications for malleable castings and discussed briefly the question of machineability and its relations to the physical properties of malleable castings at present specified.

Dr. Richard Moldenke, Watchung, N. J., presented the report of committee A-3 of which he is chairman, in which the committee recommended the advancement to standard the tentative specifications for chilled cast-iron wheels, for foundry pig iron, and for high-test gray-iron castings. It was recommended that recommendations which previously had not been referred to the committee should first be voted upon by committee A-3 and if favorably received should be submitted to letter ballot.

Consider Cast Iron

GREAT interest was shown at the final session on cast iron held Friday evening, June 27. This centered in the development of suitable specifications for cast iron pipe. Within recent years this subject has been given considerable attention by engineers and manufacturers. The physical tests called for in existing standard specifications have been studied with a view to raising the requirements.

The committee on papers accordingly arranged a discussion on this subject. Dr. Richard Moldenke, Watchung, N.J., presented an investigation of cast iron for pipe made by the author for the manufacturers of this material. It was found that with present day material and practice the existing specifications are too difficult to meet. Operating tests to improve the metal by varying the mixtures failed to give desired results. Dr. Moldenke recommended that the whole subject of cast-iron pipe be made a matter of further research, the engineers to study methods of testing it, and manufacturers of pipe to standardize their plants and practice so that the best results may be obtained with materials commercially available.

J. T. Mackenzie, chief chemist, American Cast Iron Pipe Co., Birmingham, Ala., presented data on 113 sets of standard test bars of 2 by 1 by 26 inches, of widely different analyses and origin, showing that within the limits of error of melting and testing the deflection at a given point increases as the carbon plus one-fourth the silicon content. The author advocated that a minimum value of 1900 pounds for measurement of the deflection point be incorporated in the present specifications for cast iron water pipe.

A paper was presented by C. G. Lutts, United States navy yard, Boston, covering the effect of proofing of chain on length and resistance to shock and demonstrating that chain is made brittle by proofing. The author discussed the effects of annealing of chain on its length and on its resistance to shock, showing that overstrained chain is brought back to strength by annealing, the resistance to shock being increased five fold. It appears that successful results were obtained by the following annealing temperatures: 960 degrees Cent. for ten minutes, 700 degrees Cent. for one hour, and 600 degrees Cent. for one hour. From a practical standpoint, the low-temperature anneals offer advantages of non-scaling conditions and consequent freedom from excessive wasting away.

Discuss Developments in the Foundry

A series of three articles entitled "Recent Developments in Foundry Practice" by E. V. Ronceray, Ph., Bonvillian & E. Ronceray, Choisy-le-Roi, near Paris, which were published in the *Revue de Metallurgie*, Paris, have been issued in pamphlet form by the author. In the first article Mr. Ronceray reviews the general progress that has been achieved, especially as regards co-operation between metallurgists and the practical foundrymen. He also deals with the organization of laboratories. A general study of fuel, semisteel, synthetic cast iron, American malleable iron and light metals follows. The improvements in the construction of cupolas, and furnaces also are reviewed. This article ends with some notes on sands and the cleaning of castings. The second article dwells on cupola operation and on the various methods of molding. In the third article the preparation of cores and the utilizatin of core oils are studied. The author also surveys the handling of sand, the general layout of the modern foundry, and theorganization of apprenticeship courses, as well as the present schemes for training foundry engineers.

The Pittsburgh Foundrymen's association held its annual summer outing at *The Pines* on the Perrysville road near Pittsburgh, June 23. O. C. Dobson, who is Pittsburgh manager of the Carborundum Co., was chairman of the entertainment committee and H. P. Spilker of the Sterritt-Thomas Foundry Co., Pittsburgh, was in charge of transportation.

Melts Iron in Twin Furnaces

Two Electric Units Mounted on Turntable 180 Degrees Apart and Having One Set of Electrodes, Provide Small Batches of Hot Iron at Short Even Intervals

BY A. W. BRYANT

TO PROVIDE small hot batches of metal for light castings at regular intervals of about three-quarters of an hour each, a multiple electric furnace installation recently has been made at the plant of the Kelly & Jones Co., Greensburg, Pa. The furnaces were designed by Wm. Swindell & Bros., Pittsburgh, with the idea of eliminating the unproductive period between heats by melting smaller amounts of metal in a shorter period of time. The Kelly & Jones company manufacture a line of plumbing and valve fittings in gray iron, steel and malleable iron.

Previous to the installation of the electric furnaces, a side blow converter of 1-ton capacity was used to supply the molten steel. The work turned out by the plant is composed almost entirely of thin walled tee or elbow castings ranging from small diameters to sizes as large as 12 inches in diameter. The metal, which runs entirely around the core, must be hot to pour the casting successfully and must be sufficiently ductile to withstand the contraction strains while cooling. However, the shop is large and employs a large number of molders, making it essential that the metal come fast enough to keep the molders busy.

The melting unit consists of two acid lined furnaces of 1½ tons capacity each. The furnaces are mounted on a turntable 180 degrees apart. However, only one power station and one set of electrodes are supplied for the two furnaces. A view of the melting installation is shown in Figs. 1 and 2 and a view of the steel foundry bay and the melting unit is shown in Fig. 3.

The furnaces are operated in the following manner. Both furnaces are charges and the turntable swung into the melting position and locked by throwing a lever. The electrodes are lowered into one of the furnaces and the power turned on. The first heat on a cold furnace is melted down ready to pour in one hour. At that time the electrodes are hoisted clear of the furnace roof at a speed ratio which is three times as fast as the speed used for the melting operation. The turntable then is swung around by a hand lever until the hot furnace is directly over the pouring pit, shown in Fig. 1, and the cold furnace is in line with the stationary electrodes at the power station. The electrodes are lowered at a high speed rate until they come in contact with the charge. The speed ratio then is reduced to that of the regular melting practice.

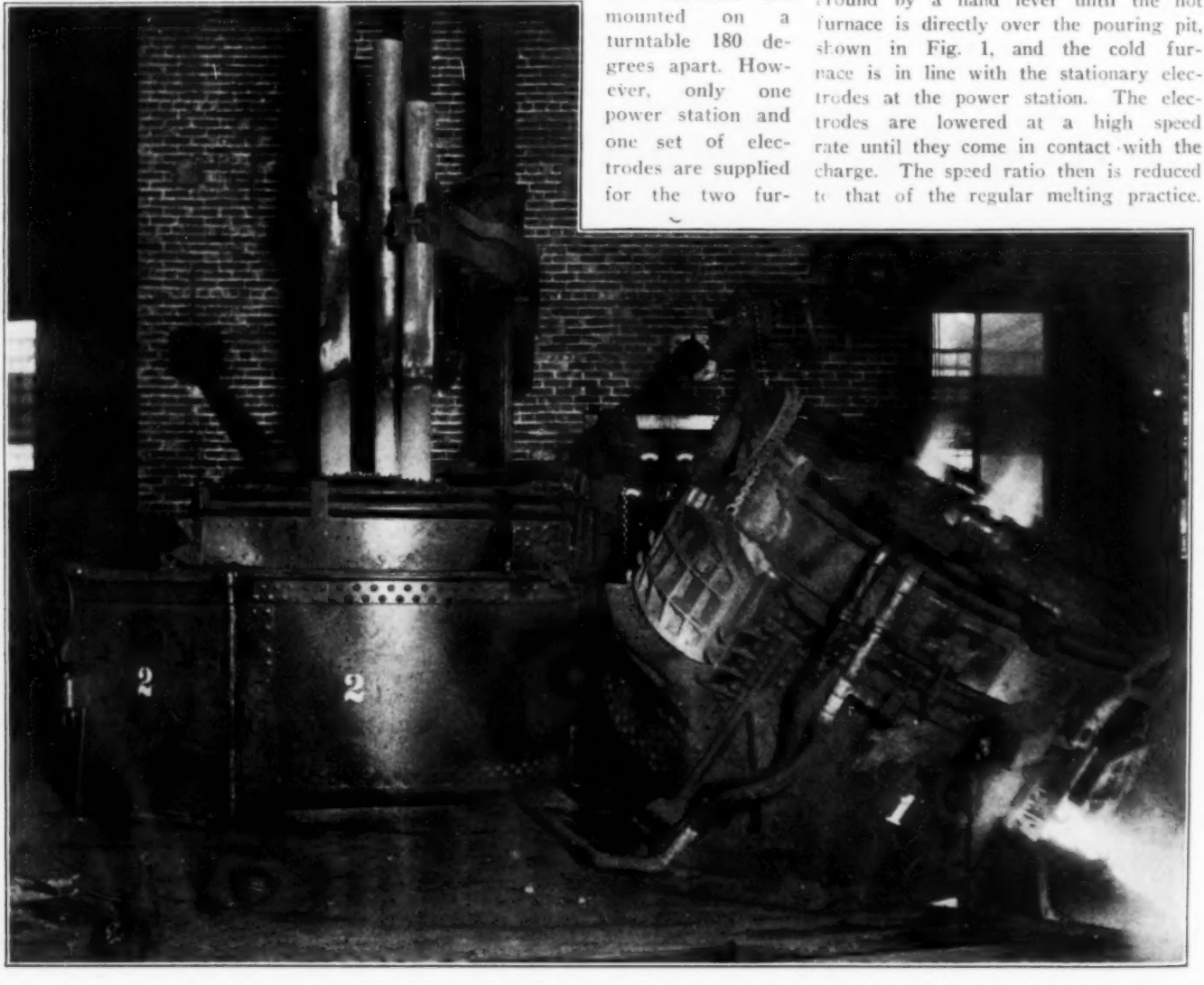


FIG. 1—THE CHARGE IN ONE FURNACE IS BEING MELTED WHILE THE OTHER UNIT IS BEING POURED

Chute Cuts Unproductive Charging Period

DURING a period when the author was connected with the Ford Motor Co., Detroit, a need was felt for obtaining hot fluid metal from the electric furnace at regular short intervals. This need especially was emphasized when a 3-ton furnace was placed in operation to melt gray iron borings to pour cylinder castings on a production basis.

The cylinder molds were machine made, assembled and poured on a conveyor. The borings were melted under basic conditions in about three hour intervals. The metal was teemed into a 3-ton ladle for transferring to the pouring floor. It then was poured into a 1500-pound ladle which was used to pour off the cylinder molds. The first part of the metal was hot and fluid while the last part would begin to get sluggish before it all was poured. This sluggishness was caused in part by the low sulphur content due to basic operations and in part to the double transfer of the metal. The double transfer of metal was necessary because the crane could not get to the cylinder mold conveyor which was equipped with a monorail system for handling the metal from the cupola. The pouring operation required about 20 minutes, and even if the double transfer was not made, the metal had to remain in a hot fluid state to pour thin walled castings. It seemed more practical to tap off 1500 pounds of metal at a time, but this method ruined production on the melting end. The best furnace production records were made by getting rid of the total supply of molten metal and starting a new charge.

Under these conditions, after the molds had been shaken out and new molds made, it sometimes was necessary to shut down the conveyor until the next 3-ton batch was melted.

The furnace was hand charged, this operation consuming between 20 and 30 minutes. To cut down the charging time, a platform was built 25 feet above the floor and 10 feet back of the charging door. A removable chute connected this platform with the charging door. The charge was made up and held on the platform until charging time when it was dropped down the chute. This method cut the charging time to 7 minutes when no repairs had to be made on the furnace between heats. However, the time necessary for repairs lengthened the unproductive period considerably. This method of charging was adopted for both steel scrap and borings, depending on the kind of metal to be melted.

The chute worked nicely provided small scrap was selected. Large pieces had a tendency to bounce after hitting inside the furnace, which sometimes broke an electrode or injured the side walls. This method of charging cut the lost time between heats to a minimum, and on a single furnace operation was the best method that could be used to get metal at regular short intervals.

The furnace containing the molten metal is tapped out and the bottom and banks repaired. It then is charged by hand and made ready, so that when the heat in the opposite furnace is ready to be tapped, the other furnace may be put in

FIG. 2—THE TWO UNITS ARE MOUNTED ON A TURNTABLE 180 DEGREES APART WITH THE ELECTRODES PLACED ON ONE SIDE AND THE POURING PIT DIRECTLY OPPOSITE

the melting position and the furnace containing the molting metal is put into the pouring position. After the first few heats the furnaces become heated thoroughly and hot batches are turned out in 45 minutes.

Thus one furnace always is melting while the opposite one is being made ready, so that when one is ready to pour the other is ready to go under the power. Only three minutes elapse from the time the power is taken off one furnace until it is on again in the other furnace.

In this manner small hot batches are provided at regular intervals of about three-quarters of an hour each. The metal is hot enough to pour the lightest of castings and the amount is small enough so that all pouring is completed before the metal has had much opportunity to cool. If desired, the metal may be hand shanked directly from the furnace in the pouring position without holding up the melting operation which is being carried on in the opposite furnace.

The turntable is an extremely simple affair. A heavy I-beam is bent into a circular shape and is supported by six roller bearings which are grouted into the foundation. The ends of two heavy parallel beams are fastened securely on the inside of this circular beam. On these two parallel beams the "A" frames of the two furnaces are set. The beams all are tied into a central pivot operating in a ball bearing. The whole frame is covered with steel plate. There are no beams or supports directly under the furnaces and the tilting gears and motors are assembled on the steel plate, so that no damage could be done by a run out through the bottom of the furnace. The weight of the whole mechanism is distributed so evenly between the roller bearings and the central ball bearing pivot that one operator has no trouble in shifting the table from one position to the other.

The construction offers many mechanical advantages. The electrode supports are not fastened to the furnace shell, but are supported by independent vertical beams mounted on the concrete floor and are tied securely at the top to the transformer vault. It has been the author's experience that these supports attached to the furnace shall tend to distort the same, making it hard to fit the spare roof on the furnace and to match the roof with the electrodes without considerable adjusting on both the roof and the electrode clamps. The furnaces have been in operation for

Weight and Analysis of Steel Heats

Weight per heat, pounds	Chemical analysis Carbon per cent	Manganese per cent	Silicon per cent
3072	0.20	0.50	0.41
3077	0.22	0.51	0.40
3064	0.20	0.50	0.39
3070	0.18	0.48	0.39
3079	0.22	0.40	0.39
3074	0.20	0.47	0.34
3069	0.22	0.49	0.47
3067	0.23	0.51	0.33
3069	0.22	0.55	0.37
3071	0.24	0.51	0.40
3067	0.24	0.55	0.40
Average 3069	0.215	0.51	0.38

PLANT SPECIFICATIONS ON ABOVE STEEL

Carbon	Manganese	Silicon
0.18 to 0.24	0.45 to 0.60	0.30 to 0.40

PHYSICAL SPECIFICATIONS

Ultimate strength	Elastic limit	Elongation	Reduction of area
65,000 to 70,000	30,000 to 35,000	30 to 40 per cent	45 to 55 per cent

120 degree bend test over 2-inch rod.
2000-3,000 pounds per square inch porosity test.

FIG. 3—GENERAL VIEW OF ONE BAY OF THE FOUNDRY WITH THE ELECTRIC FURNACES AT THE LEFT

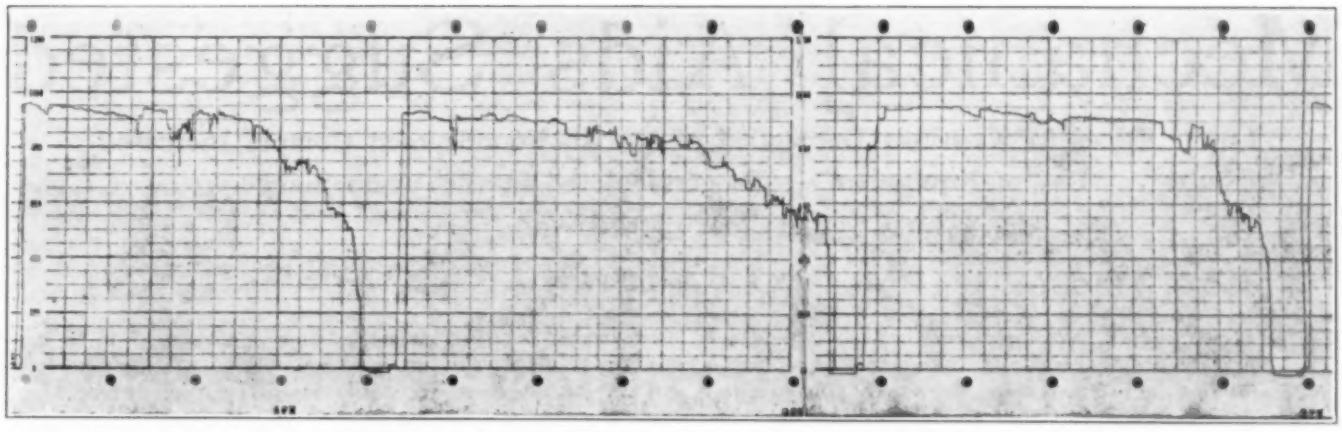


FIG. 4—THE POWER CURVE TAKEN FROM THE WATTMETER IS RELATIVELY SMOOTH

a year and the electrodes still match up with the spare roofs, the roof alone being adjusted. Neither are the electrode winches or motors set on the shell, but a special cabinet is provided in the wall of the transformer vault. The electrodes are not tilted with the furnaces and are not subject to breakage from this source.

Electrode oxidation has almost been eliminated due to their being in operation continuously, except for the small interval of time required to change the position of the furnace bodies, which requires approximately three minutes.

The furnaces never have been run to capacity on a 24-hour basis so their actual productiveness on this score cannot be determined. It is the practice to run five or six heats of steel followed by two or three heats of gray iron, made by melting borings from the company's machine shop. The best day's run consists of eleven consecutive 1½-ton heats in a nine-hour shift. The charges and analyses are shown in the accompanying table.

A better load factor is obtained by cutting down this unproductive period between heats. A power curve taken from the wattmeter is illustrated in Fig. 4, and shows a much smoother curve than one which is broken for half an hour between each heat as results from single furnace operation. This time is used in producing more steel. The shop at all times has a constant supply of metal which is not cut off when one furnace goes down for repairs as the other furnace may be operated as a single unit.

The charging door is at an angle of 120 degrees to the tapping spout. This arrangement allows the operator access to any electrode during the melting.

The steel made is a good quality acid steel in which no attempt is made for refinement of phosphorus or sulphur. Should the elimination of these elements be desired, extra voltage taps are provided at the top of the transformer so that the voltage on the furnace may be changed to suit the basic operation. It is essentially a melting proposition aimed at the elimination of all lost time and as far as the writer could ascertain has fulfilled its requirements.

Incorporate Company for Sale of Products

The Pennstate Corp., Liberty building, Philadelphia, has recently been incorporated with $10,000 capital to handle the sale of a corebinder manufactured by the Curtis Bay Copper & Iron Works, Baltimore, and other foundry supplies. The company was organized by interests associated with the Pennsylvania Foundry Supply Co., Philadelphia, and the Interstate Foundry Specialties Co., 248 Fulton street, New York City. S. H. Cleland and Edward Kahl of the latter organization, have been elected president and secretary, respectively, while S. B. Wentz and H. E. Mandel, of the Pennsylvania Foundry Supply Co., have been appointed vice president and treasurer, respectively. The new company has a branch office at 248 Fulton street, New York City and contemplates the establishment of other branch offices in the near future.

It is understood that eventually the Interstate company and the Pennsylvania Foundry company will merge into the newly organized Pennstate Corp. However, for the present they will continue to handle their separate accounts, which include parting compounds, facing sands, etc.

Make Changes in Sales Personnel

The Chicago Pneumatic Tool Co., in connection with its subsidiary companies, Canadian Pneumatic Tool Co., Ltd., Montreal, and the Consolidated Pneumatic Tool Co., Ltd., London, England, has transferred Howard Bird, for several years general manager of the Canadian company, with headquarters in Montreal, to the position of managing director of the Consolidated Pneumatic Tool Co., and director of European sales of the Chicago Pneumatic Tool Co., with headquarters in London, to succeed the late H. D. Megary. D. M. Wesbrook has been transferred from district sales manager, Minneapolis branch to Montreal, as general manager of the Canadian Pneumatic Tool Co. to succeed Mr. Bird.

Casting Sticks to Chill

Question: I am operating a small foundry where sash weights are cast in chill molds. The castings do not leave the chills readily. The chills do not last long and require constant replacement. I will appreciate your opinion on how to secure better service.

Answer: You do not state whether the iron sticks to the face of the mold or if your trouble is caused through some mechanical defect in the shape or operation of the mold. If the iron sticks to the chill it may be regarded as evidence that either the molten iron or the chill or both are too hot. If the iron is poured at a comparatively low temperature and if the chills are maintained at a temperature of not more than 200 degrees Fahr. the iron will not stick to the molds and the molds will last indefinitely. If your trouble is due to faulty design or construction of the chills, the remedy is obvious.

In one prominent installation described in THE FOUNDRY, Aug. 1, 1921, sash-weight castings are poured in water jacketed chills, set up vertically in long batteries. Each mold is split vertically through the center and hinged at the back to facilitate removal of the casting. The eye is formed at the bottom and the iron is poured in at the top of the mold.

C. K. Wehn, in charge of steel building sales, has been made assistant sales manager of the standard building department of the Blaw-Knox Co., Pittsburgh.

Mechanical Aids Suggested

Lower Prices for Castings Demanded of British Foundrymen Compel Increased Use of Equipment — Progress Noted in the Years Since the Close of the War

BY R. O. PATTERSON

THE years which have passed since the close of the great war have, with one or two exceptions, been exceptionally difficult for the general foundry trade of Great Britain. The postwar unrest, expressing itself in strikes and restrictions of output, has been one of the principal disturbing factors. The position today, while still most uncertain, is no doubt considerably better and I am glad to say that prospects at the moment are more cheering.

What is first required, in my mind, to improve matters still further is that the selling price of castings be materially lowered. This can only be done today by either lower wages or increased output. The first, I think we are all agreed, is out of the question; in fact most of us will say that wages today are too low and we would much rather like to see them increase, were such a thing economically possible.

It is also necessary to give careful study to the problem of improving the mechanical equipment of every foundry. Great progress has been made in several directions, and it behooves us to study all new processes and wherever possible apply them in our own plants. There are a few developments which I should like to mention here as being worthy of our consideration.

Take the question of centrifugal castings. This operation has been extensively developed particularly in certain pipe foundries and would appear to be making headway, making stronger and lighter pipes than is possible, thereby lowering the cost of the consumer. Developments are also proceeding with centrifugal castings for engineering purposes. There are great possibilities in this direction. Then there are foundrymen at work experimenting with oil-fired furnaces to cut out the cupola, with a view of improving the quality of their molten metal, for castings such as motor cylinders which particularly require an iron low in total carbon.

Then again, what about our cupolas? Do we make enough of our engineering knowledge and apply same to save handling of material? I have attempted recently, in a small way, to more or less mechanically charge a pair

Abstract of presidential address of R. O. Patterson, Smith, Patterson & Co., Ltd., Blaydon-on-Tyne, England, at twenty-first annual convention of the Institute of British Foundrymen, Newcastle-on-Tyne, June 4, 1924.

DISTINGUISHED PERSONS ATTENDING THE NEWCASTLE CONVENTION

Back row—Left to Right—H. F. PARSONS, treasurer Newcastle reception committee; J. ELLIS, past president, I. B. F.; J. G. PEARCE, director, British Cast Iron Research association; H. L. REASON, past president, I. B. F.; J. SMITH, president, Newcastle branch I. B. F.; JOHN SHAW, Oliver Stubbs medallist, 1924

Front row—Left to Right—REV. CANON G. E. NEWSON; LORD JOICEY, president, Newcastle and Gateshead chamber of commerce; DR. R. W. SIMPSON, deputy Lord Mayor of Newcastle; R. O. PATTERSON, president, I. B. F. 1924-5; SIR ARCHIBALD ROSS

of cupolas and while not for a moment holding this arrangement out to be a perfect one, great savings have been made. My trouble was, however, that the whole installation had to be made in our own works. The only help received was from the illustrations in the technical press. Now in this direction are there not openings in this country for good foundry engineers? One who could act as a consultant, such as our American friends have in plenty. I visited the United States in 1919, and among many other things I was greatly taken by the gyratory riddles seen there in nearly every foundry. On my return I bought three of these and can safely say that my expenses for the trip were more than made out of these riddles inside of 12 months. They are one of the greatest money savers in a foundry, and yet the local agent tells me that he has difficulty in selling them in Great Britain. Now this should not be. We should take advantage of every mechanical appliance we can lay hold of.

Test Bar Problem Difficult

The test bar question has been thoroughly ventilated during the past 12 months, and has proved to be a bigger proposition than was generally thought at the beginning. A vast amount of work has been done by the international committees, but nothing definite has been settled and it would appear that much ground has to be covered before finality is reached. I should imagine that perhaps this is a question which must be approached scientifically and without any regard to individual preferences.

Has the time not arrived to make a move in the direction of the classification of pig iron by analysis? This is a most important question and is long overdue. I know that certain pig iron makers have the greatest reluctance to do anything in this matter, on the other hand there are others who seem to want to do their best to help along the movement. The same remarks apply equally to our coke supplies. With regard to these two items of pig iron and coke, we might, I think, take a leaf out of the book of our American cousins who have got both questions settled on common sense lines. Now to help us along these lines, we have the Institute of British Foundrymen, the British Cast Iron Research association, and our various trade associations. These, while working on independent lines for the common good, ought I think to be brought into closer fusion. The Institute for the individual, the others for the firms.

With regard to our commercial associations, I think a field which might be profitably invaded is one which might be called commercial research. By this I mean that propaganda work should be instituted so that the consumption of castings might greatly be increased. For example, American railroad cars have cast iron wheels; South African telegraph poles have cast iron bases. In England we have imported wood poles, probably costing as much as steel and cast iron poles. In America and other countries they have cast steel automatic car couplers. More progress in this direction would enormously increase the output of castings and thereby decrease costs.

We now come to another question, that is the shortage of really skilled molders. Molding is perhaps without exception the most skilled of all the engineering trades. I think that a molder, and perhaps a blacksmith, is born and not made, and if statistics were taken out I am sure that a big percentage of boys apprenticed to the trade fail to become highly skilled men. Unfortunately molding is a dirty trade and it is difficult to get the best class of boy to take it up. It is therefore up to the employers to make conditions more attractive. Could we but get boys more interested in the metallurgical side of cast iron even to a very elementary degree, I am sure that their interest in their work would be multiplied many times. The most important, and by far the most interesting subject for such boys to study would be that of cupola practice. The woeful ignorance of this subject shown by the average foundry operative is really terrible, although when one looks back a few years the ignorance of the bulk of the employers on this same subject was equally abysmal.

Awarded Oliver Stubbs Gold Medal

JOHN SHAW, who was awarded the Oliver Stubbs gold medal at the annual meeting of the Institute of British Foundrymen in Newcastle-on-Tyne recently, has been prominently associated with the British foundry industry all his life. He was educated at the Farnworth grammar school, Widnes technical school, and Liverpool university. After completing his education Mr. Shaw served his time as apprentice with the Widnes Foundry Co., and owing to his ability was made assistant foreman at the age of 19. He was in full charge of a foundry at 22. After six years in charge of a small foundry in Wales he became foundry manager for Cochrane & Co., Ltd., Dudley. During the war Mr. Shaw was director of the gray iron castings section of the British ministry of munitions. For the past several years he has been manager of the Newhall works of the Brightside Foundry & Engineering Co., Ltd., Sheffield, in which plant iron castings up to 120 tons in weight have been made.

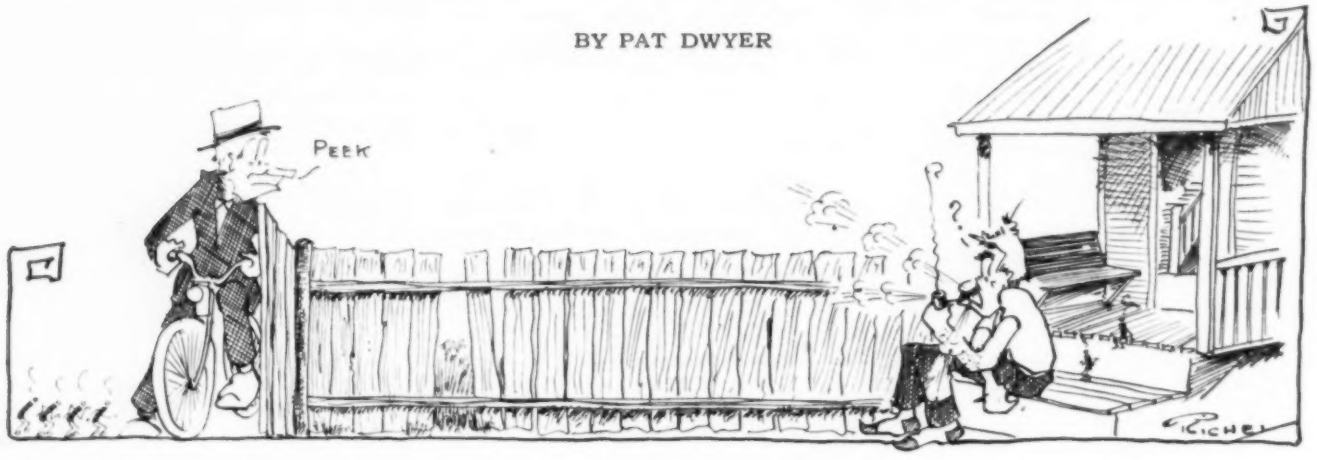
Mr. Shaw has been prominently identified with foundry organization affairs for many years. He joined the Institute of British Foundrymen in 1906. He was president of the Birmingham branch for three years and is now president of the Sheffield branch. He is the third oldest British member of the American Foundrymen's association, which he joined in 1910. Mr. Shaw represents the Institute of British Foundrymen on the international committee appointed to work out standardized tests for cast iron. He is also the delegate of the Institute of British Foundrymen to the British Engineering Standards association. He received the Oliver Stubbs medal because of his distinctive and valuable services to the foundry industry of Great Britain.

Foundry is Sold

Sale of the plant and equipment of the Norwalk Iron Works Co., Norwalk, O., to Charles B. Stanley has been confirmed. The purchase was made in the interest of bondholders, whose petition to foreclose a mortgage on the Norwalk properties forced the company into bankruptcy last December. Immediately following the purchase the properties were transferred to the Norwalk Co., a new corporation which will operate the plant in the production of the regular line of products. Directors of the new company are Charles B. Stanley, Howard N. Bissell and George F. Griffith of Cleveland; F. R. Hickman and E. H. Havens of Bridgeport; and R. C. Witmer and T. H. Hermanson of Norwalk. Mr. Havens has been elected president, Mr. Hickman, vice president and treasurer, Mr. Witmer, secretary and Mr. Hermanson, works manager.

Bill on How and Why Molds Are Stacked-II

BY PAT DWYER



SOMETIMES on these long warm evenings while I sit on the front veranda engaged in the peaceful occupation of pulling a few drafts of consolation through the stem of an old corncob pipe, I am moved to wonder if our modern standards of propriety show any marked improvement over those in vogue when I was much younger than I am now. In those good old days I heard no protest when I sat on the front steps in my stocking feet, with the remainder of my body clothed modestly and withal comfortably in a pair of old pants and an under shirt. Cuspidors were regarded as an evidence of extravagance, an appendage of the idle rich, and we expectorated freely and extemporaneously in a grass plot near the door as became a carefree and independent citizen. My feet give me no more trouble than those of the average person and on occasion I have worn shoes continuously for a period of 48 hours at a time, but under ordinary conditions I like to shed my shoes after I have stowed away the evening meal where it is calculated to render the most efficient service. In other words, to quote from our present day free and easy vocabulary with which you are familiar I like to, "give the old dogs a breathing spell."

I have yielded so far to present standards of propriety that I now wear shoes and a top shirt while I sit on the veranda in the evening. I have a cuspidor behind my chair cunningly concealed from the vulgar gaze of the passing throng; but so far I have resisted all effort or overtures either in the shape of threats or persuasion to discard my faithful old pipe in favor of either a cigar or cigaret. On innumerable occasions my attention has been directed to the elegant example set by men on neighboring verandas genteely puffing smoke wreaths from these effeminate apologies for tobacco, but I refuse to be converted. I am a hardened sinner. Dash it all, you know a man must take a definite stand at some point in his own home. Eh! What!

I even have been told that if I smoked a decent tobacco, by which of course is meant one of these brands of sweet scented hayseed favored in our best circles, my plebian adherence to a pipe might be condoned to a certain exten, but my allegiance to my early love, I am pleased to say, cannot be shaken. I still cling to a potent brand of the weed greatly favored by the proletariat for both smoking and chewing purposes. That exceedingly wise and discerning old citizen who coined the phrase about old friends, old wine and old books knew what he was talking about. Unfortunately tobacco was not known in his day or most assuredly he would have included it in the list. If any well meaning person ever starts a popular movement to select the most famous man of all time, I shall be in the front rank with a vote for good old Sir Walter Raleigh. He certainly started something when he brought tobacco from the Virginias home to England and introduced the fashion of smoking it either in cigarros or later in the long pipes. If there is anything more comforting, consoling or easy on the eyes than a picture of half a dozen old cronies sitting around a table with their long pipes and their mugs of ale, I have yet to see it.

Some time had elapsed since I had seen Bill and I was wondering idly why he had remained away, when he suddenly appeared coming around the street corner. He hopped nimbly up the steps and dropped into a vacant chair with a sigh of content. To my polite inquiry as to his whereabouts for the past two weeks he replied carelessly that he had been into the neighboring provinces of Canada and in proof of his assertion he produced and tendered me a few pieces of black tobacco which he said he had procured in a tobacco shop on St. Catherine street in the city of Montreal. Bill still retains the pronounciation he acquired in his old hobo days and invariably refers to it as *Montryhall* and to be strictly truthful the old homely appelation sounds more familiar to my ears than the more formal and accurate Montreal. However, you know, "a rose by any other name," etc.

I promptly knocked the contents out of my pipe and refilled it with a handful of the old reliable. After I had taken a few preliminary puffs the lady who sat in the swing on my right gathered the children under her wing and moved majestically toward the door. She remarked darkly that by virtue of long association she could tolerate the vile tobacco I usually smoked, but she had no intention of being asphyxiated and when I commenced smoking what smelled and looked like the mortified remains of a section of black snake that had died at some remote period from the Asiatic

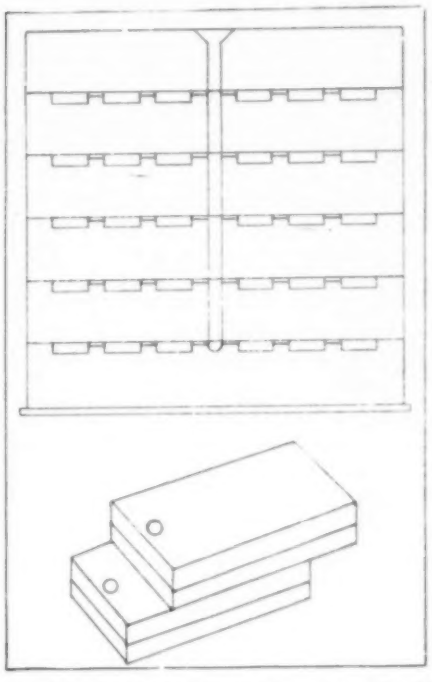
YES MY DEAR HE WILL MEET A DARK MAN

cholera it was high time to draw the line. As she passed through the door she suggested I had better take a blanket and sleep out doors all night in the swing. Bill solemnly winked one eye at me after she had disappeared and intimated that women were queer birds. I asked him what had taken him on his recent tour and he said it had been a combined business and pleasure trip.

"I visited several foundries in various cities in Ontario and Quebec," he said, "and had a most cordial reception. Some of the men in these shops I had known and worked with in other days and other places and some of the men I met for the first, but I hope not for the last time. They treated me courteously and kindly and showed me over their plants in a manner that I highly appreciated. I could not help contrasting my present experience with conditions prevailing in former days when I was wont to creep in through a hole in the fence or through the back door and with inward trepidation but an outward air of nonchalance solicit the haughty foreman for a job. On several occasions recently I was held up temporarily in the front vestibule by a uniformed guard or by a more or less important young information clerk and asked if I was looking for a job. On each occasion I had the exquisite pleasure of replying truthfully, cheerfully and emphatically that no, thank God, I did not need a job. I suppose we all are alike and I don't mind admitting strictly among our selves that I look back on these incidents as particularly bright spots in an unusually pleasant trip.

"Over 20 busy and colorful years have slipped into the vale of oblivion since last I set foot in the ancient city once known as Ville Marie and before that as the Algonquin village of Hochelaga. The city practically has trebled in population and area since I was there before and I saw no reason for doubting its claim to 1,000,000 population at the present time. However, many of the features presented a familiar appearance including the hilly streets and the many magnificent churches through which it easily ranks first in any list of cities in the new world.

"Probably I am mistaken owing to a life that never brought me into intimate contact with horses, if we except a few of the human variety, but it seemed to



ABOVE—SECTIONAL VIEW OF PLAIN STACKED MOLDS—BELOW—TWO MOLDS STACKED FOR POURING

me that the long line of one-horse cabs drawn up to the curb on the opposite side of the street from the Windsor hotel constituted the same outfit I had seen many years ago. Among the various bits of more or less useless information I have picked up at one time or another is an item to the effect that a horse does not remain in active service for more than a period of 20 years. I never had occasion to verify the statement, but now I have my doubts. I am sure the greater number and perhaps all the faithful old wrecks I saw, antedated my time and some of the rigs I am sure had the venerable appearance of carriages that might have been used by grand Seigneures who followed in the wake of Jacques Cartier. They contrasted strangely with the long line of modern motor cars that continually file through the busy streets after the manner of any large American city.

"Montreal is and always has been since its inception, the center of the great Canadian fur trade, that draws its supplies from 1,000,000 square miles of territory stretching north beyond Hudson bay well into the Artic circle and westward to the Rocky mountains. The limitless wheat fields of the western provinces pour a torrent of golden grain into the fleet of ocean going steamers that tie up to the great stone docks and later swing with the current of the mighty St. Lawrence that carries them on its broad and ample bosom 1000 miles before they breast the long heaving swell of the western ocean.

"Montreal is the headquarters of two transcontinental railroad systems. One of these has its own line of steamers affording direct communication with Europe on the east and a second line of boats with terminals in Yokohama and Hong Kong. The romantic growth and present power and prestige of the city in no manner is better exemplified than in the fact it has the largest and most magnificently appointed hotel in the British empire. Truly, says you, a long jump from the primitive Indian wigwams where Jacques Cartier and members of his early expedition spent a long and dreary winter a few hundred years ago.

"The Indians long since have gone to the happy hunting grounds. The *courier-du-bois* and the *voyageur* who gaily chanted the *chansons* of Aquitaine and Normandy, who drove their paddles in the lonely waters and in a spirit of careless bravado shot the swirling waves and rock infested passage of the Lachine rapids have peacefully departed on *le longue traverse*. The white ashes of their deserted camp fires have been whirled aloft and scattered by the wild winds that scream over the great waste places. Their names and their deeds are but a memory in the great modern city sitting under the shadow of Mount Royal."

"All quite interesting Bill" I said, "but surely you did not spend all your time sitting on a bench in Dominion park in front of the heroic bronze commemorating the deeds of the Strathcona Horse on far away South Africa battle fields during the Boer uprising and day dreaming on the history of Montreal. Did I not understand you to say you had visited

UNFORTUNATELY NO ONE KNOWS WHETHER HE IS HOLDING HIM UP OR PULLING HIM DOWN

some of the foundries and if I am not too indiscreet may I ask you if you took an odd peep into a few life saving stations which I have been informed reliably, still flourish in that part of His Britannic Majesty's outlying possessions."

"Well," said Bill with a grin, "I'll tell you. On the advice of eminent counsel and for the benefit of sundry suspicious customs officials who favored me with divers hard looks while crossing the border I refuse to comment on the second part of your inquiry. However, on the first count I am not hampered by any restrictions and I am free to admit I saw some of the largest and most finely equipped foundries I ever visited. In this connection it is interesting to note that I saw examples of molds stacked for pouring. That reminds me I was discussing that subject here recently and since the night is young I will take it up where I left off.

"The first drag with a steel band around the inside of the snap flask is rammed in the usual manner on the bench or on a machine, squeezer or jolter. It is turned over and placed on the floor or on a suitable bottom board or plate. A plate is preferable since it will not give under the pressure and also because it will last indefinitely. Bottom boards are a constant source of trouble and expense, especially if the castings extend deeply into the drag. They warp and twist and almost invariably burn out in a short time. The metal frequently seeps through the crack in the center and even if the metal does not go through, the vent soon burns the board until it is unfit for use. Usually the molder working at high speed on a piecerate basis will take a chance on a doubtful board and it is only after it gives way, thus spoiling a casting, that finally it is discarded.

"A gate pin is placed at a convenient point in the second and succeeding flasks to form a continuous opening from the top of the stack to the lowest joint. The last or top section is rammed as a plain cope or it may be rammed the same as the others with the upper end of the runner reamed out in the usual manner to form a pouring basin. Where the combined mold may be poured with a hand ladle this is not necessary, but where a bull ladle is employed with a correspondingly larger stream from the lip, it is necessary to provide a suitable opening to prevent the metal from splashing over the edge of the mold and onto the operator's feet. Neatness in pouring metal not only is advisable from a safety standpoint, but it also is an economical measure since it prevents waste of metal, besides the extra labor involved in gathering the scrap. Incidentally it helps to maintain a clean sand heap and where a mechanical sand cutter is employed it prevents accidents and conserves wear on the blades. Any considerable quantity of spilled metal represents sloppy practice and will not be countenanced by a foreman who takes a proper pride in his work and the appearance of his shop floor.

"The principal advantages of the stacked mold process are that it increases the capacity of any floor space from 100 to 800 per cent, it reduces the amount of sand required for a given tonnage of castings by eliminating from one to seven copes, it increases production to a corresponding extent and it relieves the molder of a great deal of heavy labor incident to handling a large quantity of iron. Where a monorail system or a small crane is provided, the stacked molds may be poured from a bull ladle.

"Where the castings are exceedingly light, this method is not applicable because they must be poured quickly with sharp iron direct from the furnace spout and conveyed in a hand ladle. Poured in any other manner the percentage of wasters, missrun and cold shut castings will be prohibitive. Discretion must be observed in the style of molds suitable for stacking and that is a point which only can be determined either by practical judgment backed by experience, or by experiment. However, as I said before a great many molds now made and poured singly, might as easily be poured in stack formation.

"In the second method, one that is practiced fairly extensively in light brass casting shops, also with plow points and other castings in agricultural castings shops, the molds are stacked two or three-high for pouring, but are treated as units and poured individually. The only purpose the method serves in these instances is to conserve floor space and that is a fairly important item under practically all circumstances. Where the volume of orders and the limits of time delivery impose a seemingly impossible burden on the floor capacity of the shop, stacking the molds, where practical, affords a ready solution.

"The molds in this method formed of the usual cope and drag are mounted in such a manner that the second overlaps the first at the back and the third further overlaps the second. This method naturally is limited to molds in which the runner is placed close to one end or one side of the flask. After a sufficient number of molds have been assembled in this manner they are poured singly by commencing at the lowest and progressing to the top. This is done for two reasons. First because it saves shifting the weights and second because pouring the lower mold first insures clean runners. It readily is apparent that if the upper mold was poured first, drops of metal and probably other foreign material might fall into the lower runners. The advantage of the method is that one weight will serve for two or three molds and the upper flasks provide sufficient weight in themselves to hold the copes on the lower molds. In addition, two or three molds take up no more floor space than usually is alloted to one.

"This method automatically eliminates the objection sometimes advanced against the feasibility of stacking molds for small castings. It is readily apparent that if the molds are poured individually, the castings in the lower mold will not be subjected to any more strain than if they were poured in a single mold in the ordinary manner on the floor. Stacked molds usually are placed more favorably for pouring than molds made singly. This is particularly true where the metal is poured from a bull ladle or from a crucible held in a two-man shank. Even where the molds are poured with metal from a hand ladle, the upper molds are as conveniently within pouring range as are those on the bottom tier.

"Where the melting capacity and the available help are in ample proportion to the molding capacity, the practice of stacking molds may not be necessary. Molten metal is delivered to every floor at frequent intervals of time and the molds never accumulate to any extent before they are poured. However, this favorable condition does not obtain constantly and stacking molds sometimes is adopted as an emergency measure rather than one of deliberate choice. For example, a pot may break in a brass furnace at about the time a floor of molds is ready for the metal. Where no further floor space is available it is apparent that the molder to continue has no alternative but to stack his molds.

"In the third method for stacking molds—."

"Put the rest of it away until some other time" I said. "Apparently there are as many ways of stacking molds as there are for taking the census."

"What has the census to do with it?"

"My dear boy" I said, "It has everything to do with it and I am surprised you overlooked it in your description of Montreal. The story is as much a part of Montreal as the old Bonaventure station and in all probability was erected at the same time. Naturally it is revamped and touched up occasionally to keep step with the increase in population. A tourist meeting an Irishman on the street asked him what was the population of the city and was astonished to learn that it was considerably less than half a million. He expressed his surprise and said he had been under the impression that the exclusively French part of the population exceeded that figure. His informant removed his pipe for a moment and remarked apologetically: 'Oh! Well, if ye count thim of course—'"

How and Why in Brass Founding

By Charles Vickers

Melting Sheet Copper Scrap Difficult

We lately have experienced considerable trouble due to holes in our castings and we are sending for your inspection a sample thereof. The mixture used consists of new sheet copper scrap 85 *parts, lead* 5 *parts, tin* 5 *parts and zinc* 5 *parts. Can you tell us the cause of this porosity?*

Sheet copper scrap usually is difficult metal to melt without excessive oxidation, or more probably aeration, and in all probability this is the source of the porosity. If the copper consists of triangular pieces with needle-like points which come from coppersmithing operations it is difficult to get the material into proper shape for the crucible. However, this must be done to a certain extent. The copper must be pounded together so it will not hang on the crucible walls. The best way of using the scrap copper is first to melt an ingot of copper as a part of the charge and have several inches of charcoal on top of this fluid copper which is allowed to get hot and sky blue under the charcoal. Drop in as much of the scrap copper as will be dissolved without congealing the bath. Then reheat this and charge more copper, continuing this operation until all the copper is down. This will not consume as much time as might be thought. After the copper is molten drop in one ounce of phosphor copper per 100 pounds of metal and add the white metals. Pour while the metal is hot enough to be perfectly fluid, instead of allowing it to go dull and sluggish. The latter condition is a fruitful source of porosity.

Pressure Casting Metal

Kindly inform us through your columns how we may obtain tight brass castings weighing about 10 *pounds each. We use them for water heater heads, and the castings must stand a pressure of* 190 *pounds per square inch.*

Almost any red brass alloy will meet these specifications as a pressure of 190 pounds per square inch is moderate. However, to hold any pressure over a few pounds it is necessary to make castings that are all-metal, and not part metal and part dross. It is the dross that fails to hold liquids or gases under pressure, the reason being the dross is nonmetallic, merely dirt and it forms a convenient pathway through the metal itself.

When pressure castings are to be made in a foundry not accustomed to such work it is advisable to forget about the junk pile, from which the usual run of castings is made, and it also is advisable to make a complete new start with new ingot metals, new crucibles, and a good molder on the job. The castings will be made and nothing will be heard about them later. While the use of junk may be justified in some cases when the castings are made of *brass* simply because iron would rust; the attitude of thinking that all castings can be made of such material should be abandoned, for it does not pay. Dross is not metal and if it escapes the castings, it will be found in the skimmings and is that much weight lost to the foundryman.

Using Permanent Molds

We understand that brass castings are being made successfully in iron molds and we desire the address of some manufacturer of such molds. We manufacture hardware and use large quantities of small brass and bronze castings which we would like to make in iron or other permanent molds, if such a process is being used.

The problem of how to make brass and bronze castings in iron or other permanent molds has not been solved. It is still with us, in spite of all the efforts that have been made from time to time. Certain alloys containing aluminum, on the order of a manganese bronze are being made in molds of plaster of paris to rather exact dimensions, but they appear to be costly. Castings also are being made of aluminum bronze successfully in die molds, but red brass and yellow brass parts are still made in sand molds in the old-fashioned way.

It is possible, of course, that parts die cast of aluminum bronze could be used to advantage, but it would be advisable to purchase them from some established manufacturer than to attempt to make them in a sand foundry. Such castings are made to close limits of size and there is the possibility of saving machine work by their use, when they become cheaper than sand made castings. The first cost of such castings generally is much greater than that of sand castings.

Brass Castings Split

We cast a washer 29 *inches outside diameter, and* 16 *inches inside diameter by* 5/8 *inch thick. The metal used was yellow brass, the first casting being poured in an alloy of scrap copper* 66 *per cent; zinc* 33 *per cent, pouring two up. In the case of the second the copper was changed to ingot copper, but for the third casting the mixture was changed to* 75 *per cent copper* 25 *per cent zinc. All three castings came the same, though the last casting was better than either of the others, but it was defective the same way. In every case the casting showed a clear separation appearing as if two washers had been made and just joined on the circumferences. In other words the castings split after the periphery was turned off.*

A number of theories have been advanced to account for the phenomena described. However, all of these theories are speculative, instead of being based on careful experimental work carried out under the supervision of trained technical workers. In the absence of a scientific investigation and not desiring to *run a bluff*, we will state that we do not know, why castings should split in the manner stated. We can advance theories, which are as good as any, but they are only theories. In some cases we feel justified in believing the splits are due to gases compressed laterally within the castings, but gases could not cause the split in the case of comparatively large castings, such as described. In such cases it appears to be a phenomenon associated with the shrinkage of the alloy. The space of the mold is flooded immediately by the molten metal and no more can get in. Evidently under such conditions, if the liquid filling the cavity decreases in volume it cannot fill the cavity any more. There is bound to be a vacancy somewhere and the interior is where the shortage of metal will be found, because it remains in the liquid state longest. We suggest, therefore, that such castings be poured on an incline, with sprue at lowest point so that the metal runs uphill, and into a heavy riser which is bushed 4 inches above the top of the mold. After filling the sprue, cover it with sand and beg on a weight, then pour hot metal down the riser. Incidentally yellow brass is subject to this trouble. To the 75-25 add 2 per cent of tin and 2 per cent of lead and deduct from the copper.

Selling Steel Foundry Work

Basing Price Schedules on Weights of Castings Alone May Lead to Unprofitable Business for the Foundry or Cause the Consumer to Pay Excessive Prices

BY W. J. CORBETT

MUCH attention has been given to manufacturing in the steel foundry industry while little notice has been paid to merchandising problems. Consequently great improvement has been made in the methods of manufacturing steel castings, while the product commonly is sold in a manner similar to that employed in the early stages of the steel casting industry.

Foundrymen and consumers apparently have adopted the customs which are well established in the rolling mill industy, and are satisfied to consider steel castings as tons of material rather than manufactured articles made of steel. This has led to the merchandizing of steel castings on a weight basis. Selling steel castings by a single standard, such as by weight, is unfair to the consumer and producer alike. Every foundrymen knows that the cost of making a casting of a certain weight may differ vastly from that of making another casting of different design, but same weight. Nevertheless many foundrymen are content to sell castings by weight and consumers are willing to pay the same price for different castings if the weights are the same. Under such conditions, it is obvious that the consumer pays too much for some castings and too little for others.

If the foundry realizes a profit, it is not due to the use of good business methods, but perhaps to the law of averages working in favor of the plant. In this case, sufficient profit must be derived from the sale of a part of the castings to make up for the losses on the remainder of castings produced. The safe way to purchase castings is to insist on an individual price for the castings from each pattern rather than to pay one price for all castings of the same weight.

The cost of labor is by far the most important item in the cost of making steel castings, the cost of the steel used being relatively small. This is a good reason why castings should not be sold by weight alone, as is done in the case of steel rails where the cost of labor is small compared with the cost of the steel used. The amount of labor necessary to make a casting determines to the greatest extent the total cost of the casting and the labor depends upon the design of the casting and not on the weight. Therefore, the design of the casting governs the cost of production and it is wrong to assume that the weight is the predominate factor in determining the cost. Since each casting of a particular design has a definite production cost differing from other designs, just as steel rails have a cost of production differing from that of steel chain, it is essential that the selling price of the casting be determined from the production cost of each type of casting.

The author is industrial engineer, Electric Steel Founders' Research group, Chicago.

First Sold at Flat Price

Years ago all miscellaneous castings were sold at a flat price per ton or per pound, regardless of design. Large castings and those of intricate design were sold at the same price as small castings and those of simple designs. This method was superseded later by one slightly less crude, which consisted of establishing a separate price for all castings having the same weight, regardless of the design. By this method a schedule of prices was used which was subdivided by weights of castings. It is just as absurd to market steel castings in this manner as it would be for a steel company to market rails, sheets, nails, wire pipe, chain and other steel products on a single schedule of prices based entirely on weights.

Defects in the method of marketing and buying steel castings on a schedule of prices based on weights easily can be shown. In this schedule separate prices are fixed for castings having weights between 1 and 10 pounds, 11 and 25 pounds, 26 and 50 pounds and up the scale to the largest weights.

All castings from patterns listed in the following table sold for one price, in this instance 22 cents being the price set. However, due to the differences in design, the production costs vary widely. It should be possible for a consumer to buy castings having a low production cost at a lower price than must be paid for castings having a high production cost, and the foundry should receive a better price for castings which cost more to produce.

The following table, in which the castings weigh between 11 and 25 pounds, shows the wide range encountered in the actual cost of castings.

Pattern number of casting	Weight of one casting, pounds	Production cost cents per pound
A-25	12	24
A-83	23	12
A-74	18	20
A-11	20	34
A-44	24	11
A-37	22	9
A-62	15	14
A-60	19	10
A-98	14	20
A- 4	20	22
A-56	11	42
A-16	16	23

Unless care is taken in the amount and type of work accepted, the foundry will not realize a profit. For example suppose that a consumer purchases castings weighing between 11 and 25 pounds at 22 cents a pound and that castings from patterns A-11, A-56 and A-16 are ordered in large quantities, while castings from patterns A-44, A-37 and A-60 are ordered in small quantities. The production costs on the castings ordered in large quantities are greater than the selling price, which would necessitate the foundry working at a loss in filling the order. Consequently the management would have to charge enough for castings made for other customers to make up this loss.

On the other hand, if the customer purchases a large quantity of castings from patterns A-44, A-37 and A-60, paying 22 cents per pound, and at the same time does not buy castings having a high production cost, a price much higher than the cost of production must be paid for the castings. Thus the foundry must secure sufficient profit from this consumer to offset the losses on castings ordered by another user. Conditions such as these which result in price schedules subdivided by weights regardless of design, obviously are unfair to consumers of steel castings. Such schedules are based or rather depend on the law of averages, which means that the foundry is depending largely on Providence. If the law of averages happens to favor the foundry, which is indicated by the financial statement, it may be deducted that the losses in-

curred on some castings were offset by long profits on other castings.

To remedy this evil castings from each pattern should have a definite price based on the cost of producing the castings. This method would be fair to both producers and consumers, since consumers do not expect to buy castings at a price lower than the cost of production and the foundry should not sell under this condition. Foundries are making castings for one purpose only, namely, to secure a fair return on the capital invested.

A foundry producing miscellaneous castings in some respects is like a department store, since it produces diversified articles made of cast steel and each one has a separate cost of production. A department does not sell its various articles of merchandize at an average price, but has a separate price for each item. The foundry should use the same method in determining the selling price of various pieces. The fairest and most equitable method of merchandizing is at a separate price for castings made from each pattern. A schedule of this kind must be based on the cost of production. This means that the foundry must determine the cost of individual castings and it probably is safe to say that progressive foundries follow this method.

German Firm Builds Core Machine

BY HUBERT HERMANNS

A NEW method of making core of irregular shape for automobile cylinders and other kinds of machinery has been developed in Germany, using a swing-head squeezer type machine fitted with a turnover and drawing mechanism. Some of the cores made on this machine are illustrated in Fig. 2. At *A* ¼-inch elbow cores are shown. Cores for harvester fingers are indicated at *B*; ½-inch double elbow cores at *C*; valve cores at *D*; cores for pepper-mills at *E*; cores for sewing machine arms at *F*; and cores to be used in making faucets are illustrated at *G*.

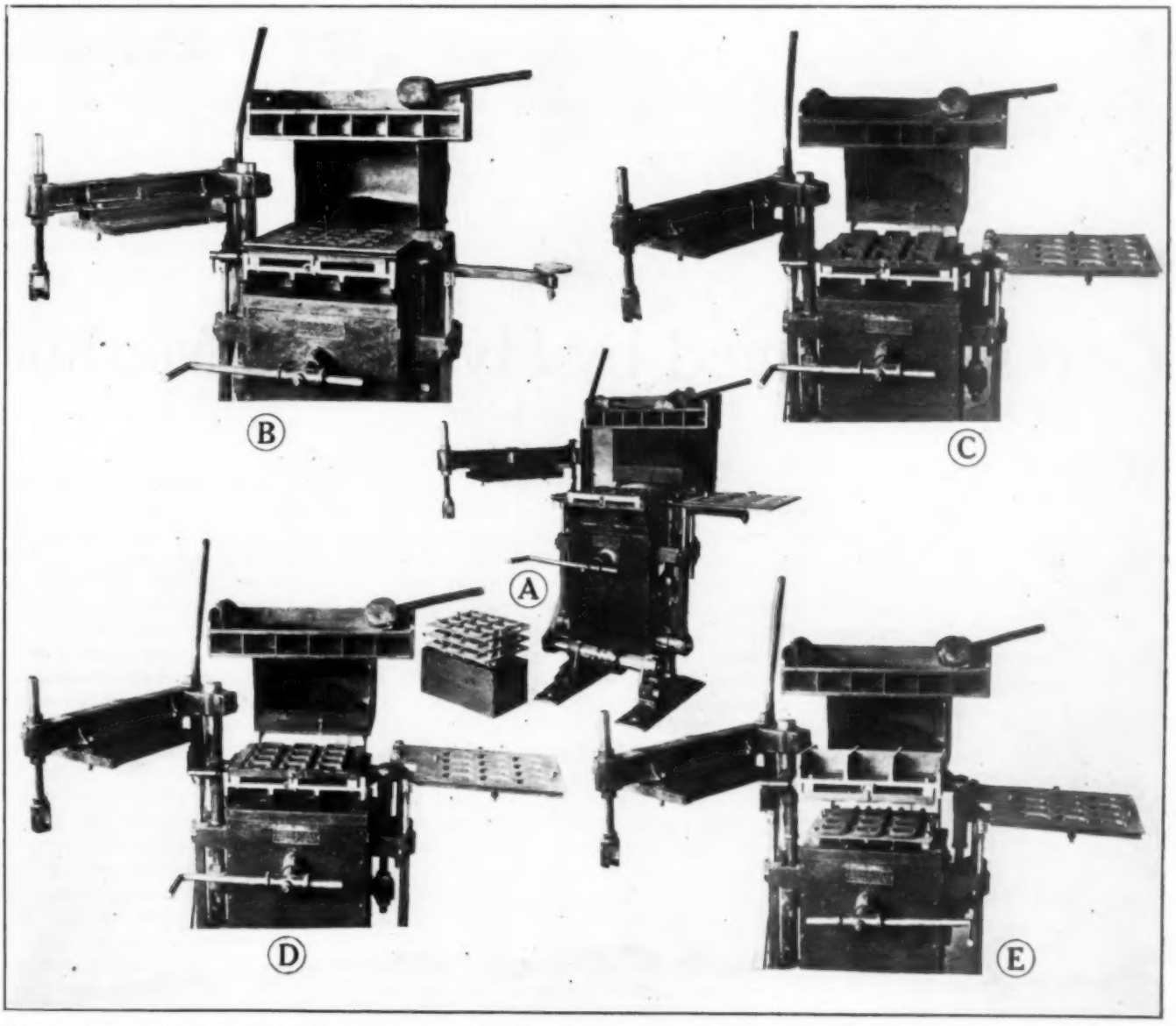


FIG. 1—A; GENERAL VIEW OF MACHINE—B; FORMING PLATE ROCKED OVER ON LOWER HALF OF COREPLATE—C; FORMING PLATE ROCKED BACK LEAVING CORES ROUGHLY SHAPED—D; FULLY FINISHED CORES AFTER SQUEEZING OPERATION—E; TABLE TURNED OVER AND CORES DEPOSITED ON DRYER PLATE

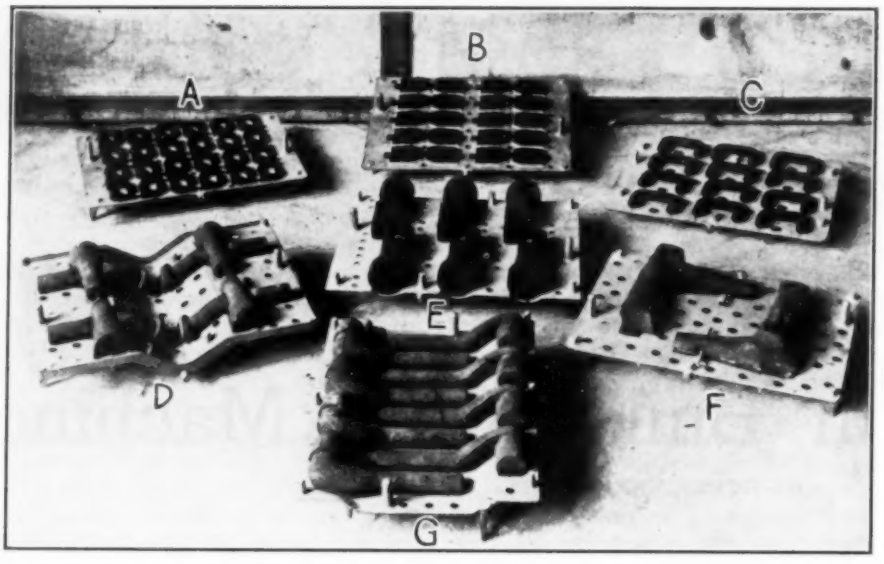


FIG. 2—VARIOUS CORES MADE ON MACHINE—A; ONE QUARTER INCH ELBOW CORES—B; CORES FOR HARVESTER FINGERS—C; ONE HALF INCH DOUBLE ELBOW CORES—D; VALVE CORES—E; CORES FOR PEPPER MILLS—F; SEWING MACHINE CORES—G; CORES FOR FAUCETS

The machine is built by the Vereinigte Schmirgel & Machinen Fabriken A. G., Hannover-Hainholtz, Germany. It is designed primarily for operation by women. As shown at *A*, Fig. 1 it is provided with a sand box, a shelf for tools, and a set of compartments for core wires. The presser head can be swung out and the mechanism is so balanced by counterweights that the squeezing of the cores, lifting, and drawing is readily accomplished.

The method of operating the machine is illustrated in Fig. 1. These views show how the double elbow cores *C*, Fig. 2 are made. The making of the plate of 12 cores, including the insertion of wires in each core, is said to take 1½ minutes.

One half the metal coreplate or box is fastened to the table of the machine, the other half being carried by the swinghead as shown in *A*, Fig. 1. At the right is a perforated forming plate, which when turned over onto the lower half of the coreplate, as at *B*, Fig. 1 serves as a ramming box and forms the cores roughly to shape as shown at *C*, the sand being pressed loosely into the perforations in the plate by hand and struck off.

After this operation, the top head is swung around into position over the table of the machine, and the two halves of the coreplate are squeezed together by means of the long lever on the left side of the machine. After the head is again swung to one side the finished cores appear as in *D*, Fig. 1, resting in the lower half of the coreplate. The latter is now elevated and turned over to deposit the finished cores on the dryer illustrated at *E*. This operation is performed by means of the lever on the front of the machine, the dryer plate being fastened to the coreplate with the hooks shown at *B*, *C*, and *D*, Fig. 1. The turnover table is heavily ribbed to give strength.

The perforated forming plate shown at the left in Fig. 1 at *C*, *D*, and *E*, and used to rough out the cores as described, is in two parts, consisting of a thin metal stripper and a wooden backing plate, or board, of such thickness that the requisite amount of sand will be used to form the core.

Cores Removed by Hydraulic Method

BY CARL B. LOCKHART

WASHING cores from castings has been tried at various times and places during the past 10 or 15 years without much success. Probably this is due to the difficulties encountered, such as the disposal of excess water and mud, handling of sand, the natural sloppy character of the work, and also to the fact that in a great many places there is not enough work that cores may be washed in a sufficient quantity to make it worth while to carry the expensive equipment. However, the hydraulic method of cleaning cores from castings is in use at the foundry of the General Electric Co. Erie Pa., and during the past year good results were obtained from this installation.

The Erie foundry is 375 feet wide and 700 feet long, and is divided into five parallel bays. The two main molding bays, where the large work is done, are 75 feet wide, and the other bays are used for small casting work, core rooms ovens, cleaning room, shipping room and raw material storage. Several concrete lined molding pits are provided, four being 72 feet long, 16 feet wide and 10 feet deep. The pits are constructed with slots in the walls every 4 feet so that they can be partioned off to suit the size of the particular job. There also are three circular concrete pits, one of these being 24 feet in diameter and 12 feet deep.

The work practically is composed of large thin section castings requiring a large amount of core work. About the heaviest casting made at this plant is 60 tons, the size being limited by the shipping facilities. The bulk of the work from this foundry is sent to Schenectady, N. Y., for use in the manufacture of large turbines and generators. About 25,000 tons of sand and gravel are worked into cores and facing for this large work each year, a large portion of this being old sand. The problem of digging out this amount of sand in the form of baked cores led to the experimenting with the washing process.

The first experimental work was done under the supervision of J. A. Eckels, foundry superintendent and H. E. Baily, engineer of buildings and grounds. The casting to be cleaned was set in the flask yard and a stream of water was directed on the core using the ordinary 2½-inch fire hose and nozzle, the water pressure being 100 pounds per square inch. The results were satisfactory enough to warrant further development. It was decided to use higher pressure on the water and to dispose of the excess water by screening out the coke and settling the sand, allowing the overflow to run into the plant sewer.

Early in 1921 a room was built in the foundry having a cemented floor and with walls constructed of

From a paper recently presented before the Pittsburgh Foundrymen's association. The author, Carl B. Lockhart, is connected with the General Electric Co., Erie, Pa.

heavy galvanized sheet steel supported on a wood framework. The floor area is 16 x 24 feet and with walls 12 feet high. Two large swinging doors allow large castings to be placed in the room by an overhead crane. At first the room was covered with a removable roof to keep the spray from flying around the foundry, but this was found to be unnecessary and the practice was later discontinued.

To increase the water pressure a single stage centrifugal pump direct connected to a 50-horsepower motor was installed. This pump boosts the water pressure from 100 pounds to 250 pounds and delivers about 256 gallons per minute. It was necessary to dig a sump and connect to the sewer system to dispose of the excess water. Experimental work then was carried on to determine the type and size of nozzle to use. A nozzle similar to those used on the decks of fire tugs, and having a ¾-inch tip, was adopted. The nozzle is mounted on a 3-inch standpipe, with 3-inch piping used from the pump to the nozzle. The operator stands outside the room and heavy plate glass windows permit him to observe the progress of the work. A small pipe with holes drilled in it is installed above the windows so that the operator may wash the dirt from the windows if necessary. During the first year that this room was operated the castings were turned by a crane, but now a single turntable performs this operation. The casting can be turned while the washing is in process through a control located outside the cleaning room. The turntable runs on a ball race and is constructed with a rack and pinion drive. The driving gears and a 10-horsepower motor are located outside the room.

From time to time it is necessary to clean out the rods, sand and gravel. The fine burned sand is washed down the sewer and the coke is collected in a screen over the sump. At present the core rods and the arbors are gathered by hand and the sand and gravel removed by a grab bucket and used again.

The action of water on the large cores is surprising. The principle involved is the same as in hydraulic mining. The force of the water actually breaks down the core and the volume of water washes the sand away, leaving the rods and arbors behind. A casting is cleaned easily and rapidly by this method. A casting requiring two men for one day to remove the cores has been washed in from 30 to 45 minutes. After operating the process for three years the General Electric Co., is pleased with the results obtained. The several advantages of the process may be listed as follows:

1.—Direct saving of labor.
2.—Recovery of sand, gravel and coke.
3.—Recovery of core rods and arbors without their being bent or broken.
4.—Removal of waste by water without handling.
5.—Elimination of dust in the cleaning room.

The advantages to be found in the saving of labor and sand, gravel and coke can be shown in money values. The cost of the installation complete was $4600. The cost of the water is 5 cents per 100 gallons and the cost of power 1 cent per kilowatt hour Two men are required in the operation, one being paid 55 cents per hour and the other 42 cent per hour. During the year 1923 the company figures the net saving on this process was $10,800 and the company was not able to wash all of their castings. All of the waste material is washed down the sewer and there is no cost of handling. The sand, gravel and coke are used over again. Little trouble is experienced with the sewer connection becoming clogged with the sand washed into it. Of course, only the fines and the slimes are washed in and the volume of water is sufficient to take care of this. The washing process has eliminated all of the dust from the castings and from the cleaning room, making it a desirable place in which to work. A second room is being designed so that the sand and gravel can be washed from the room rather than being removed with a grab bucket. The sand and gravel coming the two rooms, together with the refuse sand from the foundry, will go through a washing plant where all metal content including rods, fins, etc. will be recovered. The company feels that in consideration of the savings represented in labor and the recovery of waste materials, the installation has warranted all the money and effort expended. It also is thought that there is an additional field in the washing of smaller castings and in the general adoption of the wet process for the recovery of values in foundry waste.

FAKED FOUNDRY FACTS

THE EQUALIZER

The New Jersey bureau of hygiene and sanitation names several advantages of having a good modern tungsten-lamp equipment in the foundry. They are: Increased production, greater accuracy in workmanship, reduced accident hazard, reduction of eye strain, reduction of labor turnover due to more cheerful surroundings, lessening of fatigue and shop friction, and improved inspection facilities.

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Direct Metal Presents Challenge

PRACTICALLY every executive of a big plant in which a foundry forms one of the component parts, at one time or another, has given some thought to the economics that might be effected through the use of metal direct from the blast furnace instead of continuing the present usual practice of remelting the pig iron in the cupola. The amount of attention each man has bestowed on the subject usually has been in direct proportion to his familiarity or lack of familiarity with the practical details incident to the production of iron suitable for the manufacture of castings. Those who are familiar with the exacting requirements of present day gray iron castings continue to hope that some day a practical solution of the problem may be developed, but in the meantime they stick to the faithful old cupola and bend all their energies to devising operating methods that will insure a more uniform product.

Men in the other class who either through ignorance of the practical details or through a laudatory if mistaken zeal which prompts them to minimize or ignore important factors, arrive at a snap judgment on the subject and cannot conceive why their views are not accepted instantly and universally. They base their opinion on a few published articles and isolated facts with which foundrymen in general are familiar. For example, they point to the fact that in the early days of iron smelting all castings were poured with iron direct from the blast furnace. They ask triumphantly and apparently logically if castings could be made from direct metal in these days, why cannot they be made in the same manner now when blast furnaces presumably are operated more scientifically and efficiently. They direct attention to the fact that the output of several blast furnaces is poured into ingot molds and stools for steel plants, also spouts, runners and other heavy castings used in the operation of blast furnaces themselves. Again logic would seem to support the claim that if the metal is satisfactory for these castings it should prove equally satisfactory for the various blowing engine parts, for the bells and hoppers of the blast furnace and for the cradles, the doors, the buck stays, the reversing valves and the hydraulic rams and other open-hearth castings.

Practical experience has demonstrated that the metal has not the necessary strength for some of these castings, nor the density required for others. In plain non-technical language the iron as it comes from the blast furnace is too open due to the fact that it contains too much carbon in the free or uncombined form.

Each time iron is remelted it loses some of its free carbon. A portion actually is burned out and some is converted into combined carbon. The resultant product after repeated remelting is familiar to foundrymen as white iron in which all the remaining carbon is in the combined form. This iron is exceedingly hard and brittle and is of no commercial use in that form. The first remelting in the cupola usually adjusts free and combined carbons in the ideal condition for castings. Practically perfect results are secured when the pig iron is remelted in an air furnace and, of course, perfect manipulation also may be effected in the type of furnace operating with electricity.

Trade Outlook in the Foundry Industry

NO MARKED changes have been noted in foundry prospects during the first few weeks of July. Stagnation is observed in many lines, notably among shops making automotive equipment. Similarly, stove works have been inactive, the lack of orders being almost as great as during the 1921 depression. However, foundry owners have been able to say, "business is bad" with a smile and many confidently expect a pickup during the close of the month to continue through the fall. A recurrence of orders for metals is noted, and sellers of brass ingots in particular note an improved attitude among users.

Malleables Slump

May marked a decided decline both in orders and rate of operation among malleable foundries, according to the department of commerce. The orders for May as reported by 109 identical plants stood at 26,866 tons, the lowest figure since June, 1923. Of course, malleable business is seasonal to a certain degree and the summer drop always is encountered, but the low point in orders reflects conditions in automobile, electrical and railway lines. Production totaled 43,218 tons for May among the same plants previously mentioned and the rate of operation as 46 per cent of capacity compared to 54 per cent for April and 66.2 per cent for March. A few exceptions are noted among malleable foundries, particularly those making heavy railway castings. The latter continue to operate at a fair rate, although the volume of new business is decreased. Small orders for freight cars are coming on the market and considerable foreign buying has been noted, but in the main, new railway equipment is not in demand. Agricultural implement manufacture always at a low point during this season, constitutes another important malleable consumer class which continues on the inactive list.

Prices for Raw Materials for Foundry Use

CORRECTED TO JUNE 8

Iron		Scrap	
No. 2 Foundry, Valley	$19.00	Heavy melting steel, Valley	$16.00 to 16.50
No. 2 Southern, Birmingham	18.50	Heavy melting steel, Pitts.	16.50 to 17.50
No. 2 Foundry, Chicago	19.50 to 20.00	Heavy melting steel, Chicago	14.50 to 15.00
No. 2 Foundry Philadelphia	20.76 to 21.76	Stove plate, Chicago	15.00 to 15.50
No. 2 Foundry, Buffalo	19.00 to 19.50	No. 1 cast, Chicago	18.50 to 19.00
Basic, Valley	19.50	No. 1 cast, Philadelphia	17.50 to 18.50
Basic, Buffalo	18.50 to 19.00	No. 1 cast, Birmingham	15.00 to 16.00
Malleable, Chicago	19.50 to 20.00	No. 1 cast, Buffalo	16.00 to 16.50
Malleable, Buffalo	19.00 to 19.50	Car wheels, iron, Pittsburgh	16.50 to 17.00
Coke		Car wheels, iron, Chicago	16.50 to 17.00
Connellsville foundry, coke	$4.25 to 4.75	Railroad malleable, Chicago	17.00 to 17.50
Wise County foundry, coke	4.00 to 5.00	Agricultural mal., Chicago	16.50 to 17.00
		Malleable, Buffalo	17.00 to 17.50

Stocks Decline

Practically no foundries have stocked iron, although a few of the larger consumers, such as the radiator works and sanitary ware shops have bought against their third quarter requirements. Jobbing foundries probably would not have sufficient stock on hand to last over 30 days were normal operations resumed. The report of the Ohio State Foundrymen's association for May shows stocks on hand to be 82 per cent of the normal melt, compared with 87 per cent for April. Foundry operations for the entire state are noted as 75 per cent, compared with 74.6 per cent for April. This figure is noted as particularly satisfactory in view of general business conditions. Stocks received decreased during May, but some occasional buying is noted at present. Stove manufacturers report no change in operations. Many plants in the St. Louis district and in western Illinois are practically closed. Pipe orders have dropped, but practically all makers have sufficient backlogs to maintain full time operations well into the fall. Jobbing foundries in the eastern states are working at less than 35 per cent of capacity.

Pig Iron Output Drops

Production of all classes of pig iron declined sharply in June, according to statistics compiled by the *Iron Trade Review*. The total is given as 2,021,377 tons for June compared with 2,619,986 tons in May and 3,465,389 tons in March. The June total is the lowest since August, 1922, when the coal strike forced a stringent curtailment. The daily average production for June was 67,379 tons per day, compared with 84,515 tons per day for the previous month. The loss is 20.3 per cent. Merchant pig iron made in June totaled 527,212 tons, which compared with the May total of 648,656 tons gives a decline of 121,444 tons. On a daily average basis, June showed 17,574 tons compared with 20,924 tons per day for May, giving a loss of 3350 tons per day. The total number of stacks operating on June 30 was 160, compared with 187 on the last day of May. Two merchants stacks were blown in and 12 blown out during June. The opinion freely is expressed that in pig iron production as in other lines, the bottom has been reached and that improvement may be expected soon. Some of the larger automobile interests again have started production, and a few expect to attain practically full time operation by the latter portion of July. The total output of automobiles for May is given as 312,813 according to the department of commerce. This shows a loss of 60,386 compared with the previous month. The output for the first six months of the year totals 1,752,187 cars of both the passenger and truck classes, or more than 100,000 more than the first six months of last year. The last half of the year is expected to exceed a million cars production. Textile mills are inactive and a corresponding depression is noted in the eastern foundries making special machinery castings.

Nonferrous Operations

Jobbing brass foundries have encountered a period of infrequent orders. Plumbing goods shops are perhaps the most active of the nonferrous plants. Few are maintaining stocks of metals beyond immediate needs. New York prices on nonferrous metals according to the *Daily Metal Trade* of July 8 follow: Casting copper, 12.12½c; electrolytic copper, 12.37½c; Straits tin, 44.00c to 44.12½c; lead, 7.00c; antimony, 8.25c; aluminum, No. 12 alloy, open market, 21.00c; nickel, 30.00c. Zinc is 5.75c, E. St. Louis, Ill. Average monthly prices for June follow:

New York Prices

Castings Copper	Electrolytic Copper	Lead	Tin Straits	Antimony	Aluminum 98-99	Zinc St. Louis
12.329	12.623	7.078	42.66	8.343	26.66	5.79

Comings and Goings of Foundrymen

F. M. FARMER, whose election as president of the American Society for Testing Materials was announced at the annual meeting in Atlantic City, June 25, has been identified with the activities of that organibation for many years. He served as chairman of the committee on electrical insulating materials and of the committee on rubber products. He was elected a member

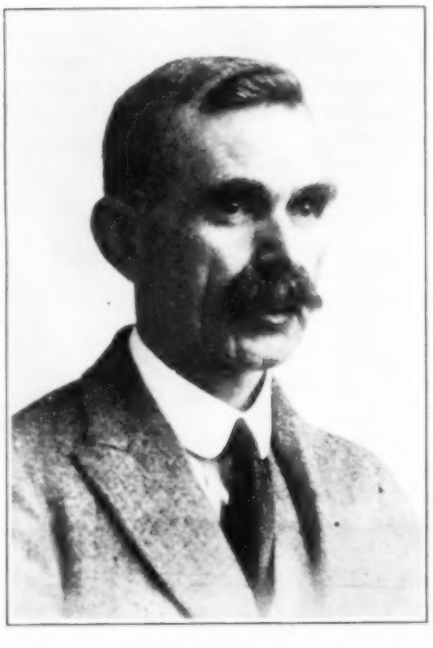
F. M. FARMER

of the executive committee in 1921 and appointed vice president in 1923 to serve an unexpired term. Mr. Farmer was born at Ilion, N. Y., March 18, 1877. He received his early education at Ilion academy and was graduated from Cornell university, Ithaca, N. Y., in 1899. After two years with the General Electric Co., he was made inspector for the Navy department where he served two years and then became connected with th Electrical Testing Laboratories, New York with which organization he has been connected for the past 20 years, now being chief engineer. He is a fellow of the American Institute of Electrical Engineers, member of the American Society of Mechanical Engineers, the British Institution of Electrical Engineers and other national societies. He has been active in the executive and technical world of these societies and has contributed numerous papers on electrical subjects.

Robert H. Finkernagel, until recently general manager of the Interstate Foundry Co., Cleveland, is sales manager of the foundry division of the Danville Iron & Steel Corp., Danville, Pa.

H. W. Edwards has been made plant manager for the Haydenville Co., Haydenville, Mass., manufacturer of plumbers, steamfitters, gas, air and oil brass and iron castings. Mr. Edwards previously had been in charge of a number of large foundries including the Pittsburgh Gauge & Supply Co., Pittsburgh, Pratt & Cady Co., Hartford, Conn., American Steam Gauge & Valve Co., Boston, Canadian Ingersoll-Rand Co., Sherbrooke, Que., and the brass valve and fitting department of the Walworth Mfg. Co., South Boston, Mass.

John Cameron, who has been elected senior vice president of the Institute of British Foundrymen, is chairman and managing director of Cameron Roberton, Ltd., gray iron founders, Kirkintilloch, near Glasgow, Scotland. This company specializes on light castings for house building and domestic purposes. Mr. Cameron is also a director of Eastern Light Castings Ltd, of Kulti, Bengal, India. He has visited India twice and Russia once in connection with iron founding questions. During the war he was one of the most prominent exponents of the manufacture of semisteel shells in Great Britain and is one of the leading experts in Great Britain on semisteel.



JOHN CAMERON

He is a member of the council of the British Cast Iron Research association and has been associated with the Institute of British Foundrymen for many years.

Vincent C. Faulkner who has been elected Junior vice president of the Institute of British Foundrymen, is a graduate of the University of Sheffield where he studied under Prof.

VINCENT C. FAULKNER

J. O. Arnold. He has been prominent in the development of the electric furnace for foundry purposes in Great Britain, in which work he also spent several years on the continent of Europe. For a time he was connected with Vickers, Ltd., Sheffield. For the past 3½ years he has been editor of the *Foundry Trade Journal*, London, in which position he has met with unusual success. Mr. Faulkner has been a member of the Institute of British Foundrymen for 15 years and was secretary of the London branch for three years and president of the same branch last year.

R. D. Bean has been made chief engineer of the Brown Instrument Co., Philadelphia.

An agreement has been made by the Chicago Pneumatic Tool Co., New York, and the Indiana Pump Co., Indianapolis, whereby each organization will use jointly the products of the other in their air-lift installations.

Option Warren Foundry and Pipe Plant

Acquisition of an option on the plant of the Warren Foundry & Pipe Co., Phillipsburg, N. J., by the Replogle Steel Co., 120 Broadway, is a definite step toward the passing of what is not only one of the largest independent cast-iron pipe firms in the country, but one of the oldest, and about which is entwined much of the romance and development of the industry. The Replogle interests have taken an option, which ends in the latter part of August, specifying the payment of $4,000,000 for the property, the equivalent of $400 a share.

Established in 1856, at Phillipsburg with a capital of $200,000, the Warren company has largely been under control of the descendants of the original founders. It is stated that fully three quarters of the stock is still in the hands of these interests. In all there are approximately 200 stockholders, the great majority of which have relatively small holdings. The present capital is $1,000,000, representing 10,000 shares of $100 par value each.

While organized originally to carry on a general foundry business, the company within a few years gave over its production exclusively to the manufacture of cast-iron pipe. The first pipe, produced in 1857 were of small sizes, made in green sand and cast on inclined banks, as was the custom in those days. However, the manufacture of large pipe was undertaken later and pipe were molded and cast vertically in dry sand. This, it is understood, was the first time this method was employed in this country, and proved so successful that all sizes were handled in this manner. The company then began to specialize in pipe. The success of this early work was attributed in no small measure to the skill of two English pipe makers, John Firth and John Ingham, who came with the company as workmen in 1857, and remained for a number of years until their death.

The company originally occupied a 6½-acre site, and comprised five buildings including a foundry, 112 by 132 feet and a machine shop, 72 by 402 feet. The property, enlarged by successive stages, now covers 21 acres and a plant consisting of 27 main buildings, of which six are used as pipe foundries. The company employs more than 600 men and has an output of 300 tons daily.

Many of the official personnel and employes have been with the company a number of years. The president and treasurer, W. H. Hulick, New York City, son of one of the founders, has been associated with the company 40 years. For 10 years, he has been president, 21 years vice president, and six years, the first of his connection, as director only. Other executives long with the company are: A. D. Chidsey, vice president and assistant treasurer, Easton, Pa., and A. L. Reiley, secretary, Phillipsburg, N. J.

The directors are Edward J. Fox, W. H. Walters, Lee Clymer, Clayton Hackett, Chester Snyder, A. D. Chidsey, and W. H. Hulick. S. B. Brown is plant superintendent, and J. H. Morrison, general sales manager

The company was incorporated as the Warren Foundry & Machine Co, but in recent years, the name was changed to the Warren Foundry & Pipe Co.

Buys Land Properties

The Great Lakes Distributing Co., Penobscot building, Detroit, has purchased foundry bank sand properties located near Saginaw, Mich., covering 160 acres adjacent to the Pere Marquette railway. Engineers estimate that there are in excess of 100,000 carloads of bank sand for coremaking. Additional equipment is being purchased which will increase the present daily loading capacity of 42 cars. For several years this company has jointly operated and had exclusive sale of the bank sand mentioned, but now is entering the producing field on a larger scale. It has in contemplation the purchase of extensive molding sand properties in Ohio.

Appoint Representative

G. C. Richards, Philadelphia, has been appointed to represent the National Engineering Co., Chicago, in the eastern district. S. H. Cleland, Interstate Foundry Specialties Corp., New York, formerly was the eastern representative of that firm.

Appointed Managers

Fred W. Bauer and James C. Mears have been appointed resident managers at Chicago of Rogers, Brown & Co., Cincinnati. Mr. Bauer formerly has been in charge of the Springfield, O., office of that company, he having been associated with Rogers, Brown & Co. since 1903. The Springfield territory will be divided between J. R. Morehead and John A. Plimpton who will travel from the Cincinnati office. Mr. Mears goes to Chicago from St. Louis where he formerly was manager. He has been associated with the Rogers, Brown & Co. since 1888.

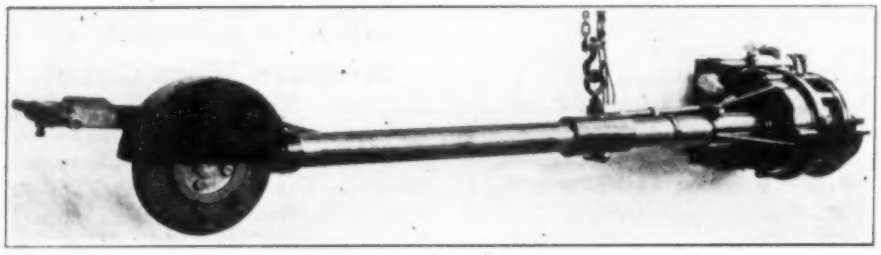
The Carter Gas Engine Co., Sterling, Ill., is having plans prepared by Frank D. Chase, Inc., Chicago, for a new gas engine plant, including machine shop, foundry and warehouse buildings.

Small Iron Charges Will Require More Coke

Question: We are melting about 3 tons of 15 per cent semisteel followed by 1 ton of soft iron, about 2.85 per cent silicon, in a cupola lined down to 32 inches. The coke bed extends upward 40 inches above the sand bottom and the charges are made up in the proportion of 500 pounds of iron to 90 pounds of coke. In my opinion the bed is too high since it calls for an increased blast pressure and this in turn is hard on the lining. Do you not think this metal can be melted hot and clean with considerably less coke? The cupola is not provided with a slag spout.

Answer: The height of the coke bed in a cupola always is computed above the tuyeres. Actual melting takes place at a definite point above the tuyere openings irrespective of how far the tuyeres are located above the bottom of the cupola. For that reason your statement that the coke bed is 40 inches deep conveys no information on which to base an opinion. Your tuyeres may be 10 inches above the bottom in which case your coke bed is about right or they may be 20 inches above the bottom and in that case your bed is too low. The coke bed should extend approximately 30 inches above the tuyeres and this measurement should be taken after the bed has settled and just before charging the first iron. You easily can decide the point by the usual practical foundry test. Under normal conditions, and that means when the bed has had time to burn through properly and the furnace is charged to the door, iron should flow from the spout about 8 minutes after the blast has been turned on. If it appears before that time it is evidence either that the furnace has been standing too long with the tuyeres open, or, that the bed is too low. Conversely, if the iron does not appear at the spout in less than 10 minutes it is evident that the bed was not properly burned, or that the bed is too high. A little careful observation will serve to decide points of this character.

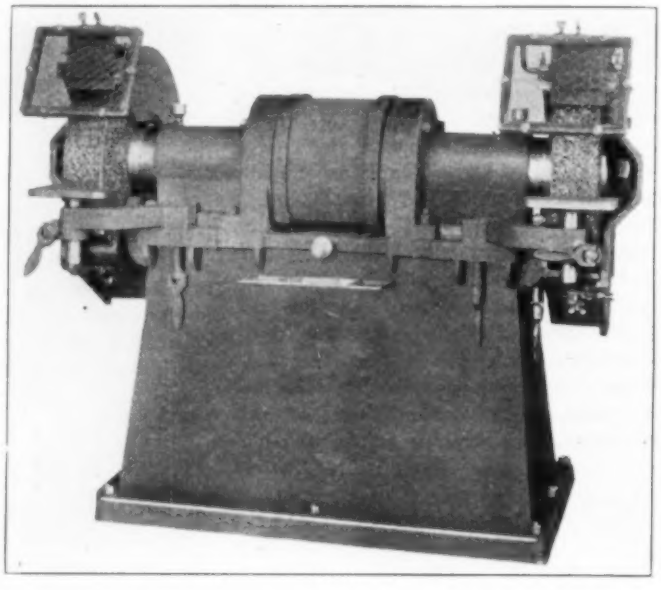
The weight of the iron charge is reckoned from the amount of coke required to form a disk 4 inches thick in the furnace. A convenient method to reckon this amount is to chalk a ring 32 inches in diameter on the charging floor, set up a row of firebrick on edge around this ring and fill the enclosed space with coke. Then either weigh or measure the coke and use that for a standard charge. Under ordinary circumstances one pound of coke will melt 10 pounds of iron. In your case we should say that 90 pounds of coke is about right, but you should increase the weight of the iron charge to 900 pounds.



THE GRINDING WHEEL MAY BE REMOVED BY TAKING THE PLATE ON THE SAFETY GUARD AND THE WHEEL FLANGE

Builds Electric Welder of Portable Type

A portable arc welder, designed to give smooth and rapid deposition of metal with thorough penetration, recently has been introduced by the General Electric Co., Schenectady, N. Y. The machine is built to deliver continuous power and permit rapid production, both with high current and large electrodes as well as low current and small electrodes. The welder is a two-unit set consisting of a motor and a self excited generator. All regulation of current is accomplished by turning a handwheel on the generator. A self-adjusting, stabilizing reactor is provided to automatically steady the arc.



SAFETY FEATURES INCLUDE HEAVY GLASS EYE SHIELDS

The welder may be used with any of the commercial sizes of metallic electrodes from 1/16 to ¼-inch. The generator voltage may be adjusted to suit the character of the work. High voltage for complete penetration on heavy work and low voltage to prevent burning through light work thus are secured. Any value of current between 75 and 300 amperes may be obtained.

Roller bearings are provided for the wheels and there are holes in the base for crane hooks. The device is adaptable to long and short leads for working close by or at a distance. The assembled unit is about 63 inches long, 29 inches wide and 47 inches high and weighs about 1600 pounds.

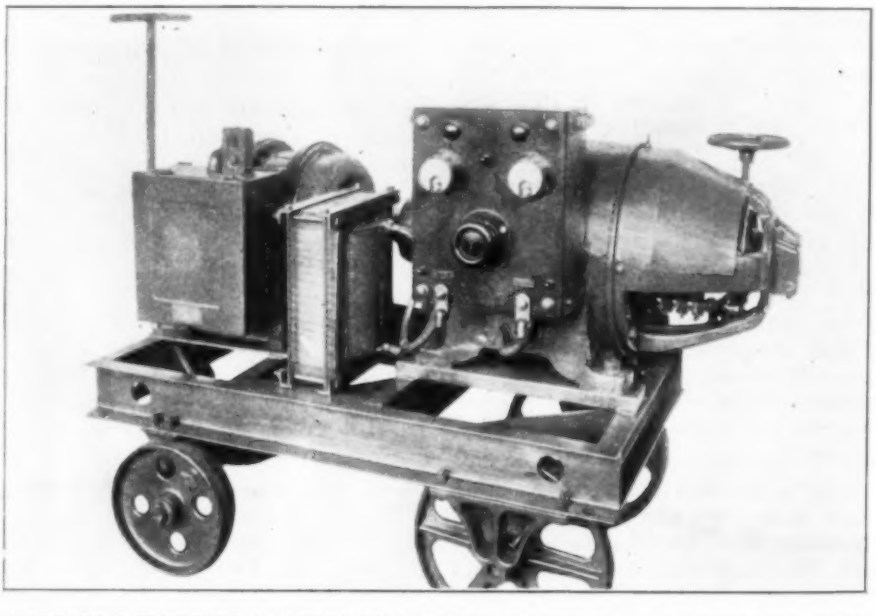
Heavy Duty Grinder Has Direct Drive

Ease of manipulation, electric motor drive and taper roller bearings are features claimed for a heavy duty floor type grinder recently developed by the Cleveland Armature Works, Cleveland. The machine is made in two sizes equipped with 10 and 15 horsepower motors and with wheels of 18-inch diameter and 3-inch face and 20-inch diameter and 4-inch face respectively. The base of the grinder is steel and cast iron electrically welded and filled with concrete to absorb vibration. The motor shaft is chrome nickel steel and operates on taper roller bearings which may be adjusted to compensate for wear.

Safety features were given careful consideration in the design of the grinder. As shown in the accompanying illustration the wheels are provided with heavy, glass, eye shields mounted on metal frames. Adjustable spark catchers deflect the sparks and abrasive dust into the exhaust system. The wheel guards are heavy steel castings which have adjustments to compensate for wheel wear. A positive shaft lock holds the spindle firmly when the operator is changing the wheel. Starting and stopping is controlled by a knob within easy reach of the operator. The wheel spindle is 34 inches from the floor while the distance between the wheel centers is 43½ to 46½ inches depending upon the size of the machine. A floor space of 28 to 44 inches is required while the overall length is 60 inches. The net weight of the 10 horsepower size is 3450 pounds and the weight of the 15 horsepower size is 3575 pounds.

Designs Electric Drive Swing Grinder

A line of direct connected motor driven swing frame grinders recently has been introduced by the Diamond Machine Co., Providence, R. I. Two sizes are built for any motor characteristics except 25 cycle in which case only one size is made. For standard frequency, one size has a 12 x 2-inch grinding wheel driven by a 3-horsepower motor, running at 1800 revolutions per minute, while the other has an 18 x 4-inch grinding wheel and is driven by a 5-horsepower motor, running at 1200 revolutions per minute. The 25-cycle machine has



PORTABLE ELECTRIC WELDING UNIT IS ADAPTABLE TO A VARIETY OF WORK

a 14 x 2-inch wheel with a 3-horsepower motor, running at 1500 revolutions per minute.

The motor in each case is carried on a special end piece rigidly fastened to the hollow arm in which the driving shaft revolves. A set of nickel-steel, spiral, bevel gears is located at the end to drive the wheel. Ball bearings are used throughout and housings are provided to protect the bearings from dust. The wheel head swivels so that the wheel may be rotated 90 degrees to each side of the vertical position, independent of the remainder of the machine. It also may be fastened at any angle.

One of the features claimed for the machine is the accessibility of the grinding wheel, which may be removed by taking off the side plate on the safety guard and the wheel flange. The construction makes it unnecessary to remove the spindle or expose the bearings. The motor is operated by a push button control attached to the operator's handle, so that the machine may be started or stopped as the operator stands in his working position. A standard, 8-foot chain hoist is supplied to hold the machine.

To Build Foundry

A gray iron foundry will be constructed to manufacture hot water and steam boilers for house heating purposes by the American Furnace & Foundry Co., Milan, Mich., which recently was incorporated with a capital of $50,000. Construction of the plant 80 x 230 feet of steel and concrete already has been started. All of the necessary equipment has been purchased with the exception of a few small tools. A production of 6000 boilers is expected. E. L. Watson is president, G. L. Laskey, vice president and F. E. Ross, treasurer.

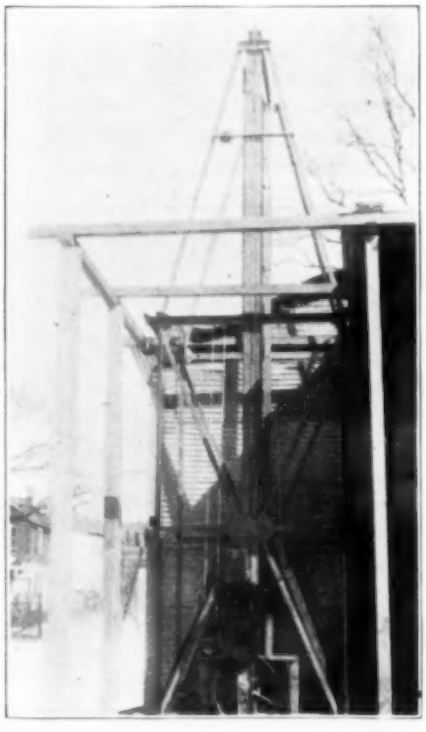


FIG. 1—ELEVATOR INSTALLED IN FOUNDRY FOR HANDLING MATERIAL TO CHARGING FLOOR

Designs Portable Elevator

The New Jersey Foundry & Machine Co., New York, has introduced a new type of portable elevator designed to handle loaded trucks, wheelbarrows, etc., from one elevation to another in places where the common freight elevator would be impractical. The machine may be used for serving elevated charging platforms of foundry cupolas, gas generators, grinding and mixing machines, and for elevating material to mezzanine floors and to box cars. It also may be used for portable of fixed position work.

Standard capacities range from 1000 to 6000 pounds, and the platform sizes from 3½ x 5 to 6 x 10 feet. An electric control automatically stops the platform at the high and low points and an electric brake stops it at a set level.

The platform is carried by four wheels which travel within guides. A double drum and double supporting rope are provided to keep the platform level at all points when moving loaded trucks on and off the platform. The machine is motor-driven through a silent chain and spur gear drive. The load is held by a brake wheel carried by the extended motor shaft with two brake shoes connected by a compound lever arrangement, one end of the lever carrying the core of the solenoid brake coil. In serving charging platforms the controller may be located at the top of the machine or operated by pendent lines so that the machine may be operated from either platform. The machine may be equipped for operation on either alternating or direct current and for any plant voltage. A view of the portable elevator is shown in Fig. 2 of the accompanying illustrations. Another type of elevator which is manufactured by the same company and applicable to foundry work is shown in Fig. 1. This stationary type machine is used to elevate material to the charging floor of the cupola.

Owing to the smoke and dust, lighting systems deteriorate at the rate of 0.0625 to 0.25 per cent daily. For the most efficient lighting a regular follow up system of cleaning should be maintained.

Change Company Name

The name and address of the Maumee Metal Parts Co., Toledo, has been changed to the Toledo Alloyed Castings Co., with offices at Hamilton and Division streets. A program of expansion is contemplated by the company. In addition to its permanent mold plant, the company has completed plans for the installation of new equipment and the construction of new buildings on property adjacent to the present plant in which will be housed an experimental and sand casting foundry. Officers of the company are A. L. Krtshaw, president and treasurer; E. E. Davis, secretary; and serving with them on the board of directors are W. H. Haskell, O. J. Bendle and T. A. Bragg. The company specializes in quantity production of castings in aluminum, brass and bronze.

Foundry Incorporated

The DeMattia Foundry & Machine Co., Clifton, N. J., has been incorporated to continue the operation of a foundry. The plant includes a modern foundry located on a large plot of ground with room for expansion. The plant will continue to make gray iron and semisteel castings and in addition will develop and engage in the manufacture of a staple line of machinery.

FIG. 2—ELEVATOR MAY BE USED FOR PORTABLE OR FIXED POSITION WORK

HEAVY RUN JOBS ARE COMPLETED ON THE LARGE MACHINE

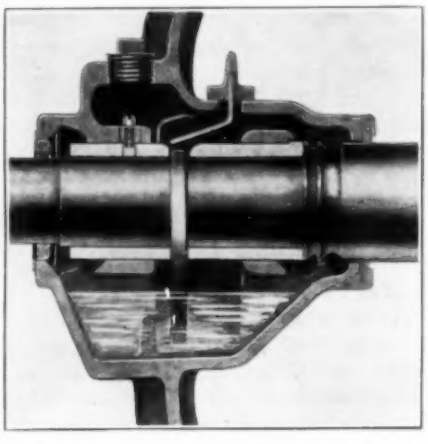
Introduces Machine for Finishing Cores

The Skeppstedt-Erickson Co., Moline, Ill., has introduced a core machine designed for use with jobs having a heavy run. The machine is placed alongside the coremaker's bench, and after the operator has rammed the sand around the pattern in the corebox, the corebox with the core is placed on the supports at the top of the frame. A cross plate is located above the supports. Brackets are fastened on the cross plate which carry vertical rods in clamping jaws and, the vertical rods are connected by cross bar on which the vibrator is supported. A trigger, which by sliding back and forth opens and closes the air valve that controls the air vibrator, is mounted on the plate.

The core box is placed on top of the machine and is pushed against the vertical rods and trigger. The box strikes the trigger first and when it comes in contact with the vertical rods the air valve has been opened by the trigger and the vibrator starts to operate. On one side of the core box notches engage in the vertical rods and prevent a lateral movement of the box. The vertical rods transmit the vibration to the corebox and guide the pattern during drawing. The vibration of the rods is most intense at the beginning of the draw and decreases as the draw is finished. A drawing device operated by a lever also is provided for use in making long draws. The weight of the drawing device is counterbalanced. A view of the machine is shown in the accompanying illustration.

Designs Sleeve Bearing

A new type of sleeve bearing for electric motors recently has been introduced by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., which is designed to prevent leakage of oil into the windings or entrance of dust and dirt into the bearings. The construction of the device is comparatively simple. Balanced air pressure in the chambers is secured by a connecting passage in the upper part of the bearing housing. A large threaded pipe plug is provided for inspecting the oil ring. An



SLEEVE BEARING HAS CONNECTING PASSAGE IN UPPER PART OF HOUSING

enclosed combination filling and overflow opening is placed in the side of the bearing and a cast iron cover is bolted over the oil ring slot.

A metal cap with a diameter at least ½ inch larger than the shaft diameter is used to prevent the felt washer from being compressed to the shaft. The oil ring, carrying the oil from the well to the motor shaft, stirs up and churns the oil into a fine spray. It is claimed that the sealed bearing prevents the entrance of dust and dirt and assures clean lubricating oil. A sectional view of the sleeve bearing is shown in the accompanying illustration.

The Chicago office of the Gibb Instrument Co., Bay City, Mich., now is in charge of W. F. Hebard & Co., 551 W. Van Buren street. Thomas Barnes, an officer in the Hebard company, will head the welding department and will be assisted by Charles Watson. Mr. Hurd, the retiring representative, will be in charge of the New England territory after Aug. 1.

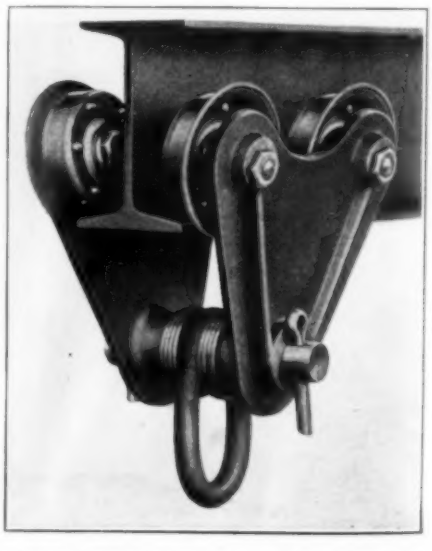
Officers Are Elected

At a recent meeting of the Detroit Foundrymen's association, Robert Crawford, Atlas Foundry Co., was elected president. Other officers elected are as follows: Vice president, E. A. Boland, American Car & Foundry Co.; secretary, Russel Scott, Packard Motor Car Co.; treasurer, Fred Cowan, W. R. Thompson Co.; executive committee, K. C. Babo, Dodge Bros., E. A. Van Dolson, Dodge Bros., H. M. Lane, H. M. Lane Co., James Mann, American Car & Foundry Co., and Fred Erb, Packard Motor Car Co.

Develops New Trolley

A new ball bearing, oscillating-type, I-beam trolley has been developed by the Chisholm-Moore Mfg. Co., Cleveland. The wheels have the bearings built in making one complete unit. The trolley weighs only 8 pounds complete. Simplicity of construction is claimed, there being only eight parts exclusive of washers, cotter pins and nuts. It is built in one size only with a capacity of 1-ton. It is adaptable to any I-beam from 4 to 7 inches and by the substitution of special separators may be used on larger beams. The load may be moved close to the track by removing the hook link and slipping the hoist hook over the equalizing pin in the lower part of the frame. The hoist and swivel connection when hung from the trolley, may be turned in a complete circle.

E. R. Doud, formerly with the Iron Trade Products Co., Pittsburgh, is now associated with J. W. Dickson & Co., Commonwealth building, Pittsburgh, in the sale of pig iron, fluorspar and dolomite products.



I-BEAM TROLLEY HAS CAPACITY OF 1-TON

Delay in Buying Continues

Curtailment of Foundry Operations Causes Slackening in Purchasing of New Equipment—Manufacturers Anticipate Little in the Way of New Business Before Late Summer

USERS of foundry equipment continue to delay closing on inquiries which have been current for some time, evidently waiting for a betterment in foundry conditions. Inquiries have fallen off in practically all distributing centers and several large lists have been withdrawn with no indication when they will be revived. Manufacturers are finding a fair demand for equipment of the lighter type, such as sand blast and tumbling mill units, but little activity is being displayed in some of the heavier types of equipment. However, many builders feel that substantial improvement should develop late in the summer.

Included in the sales are four large molding machines to the Hughes Tool Co., Houston, Tex., by the Herman Pneumatic Machine Co., Zelienople, Pa. The Pangborn Corp., Hagerstown, Md., has a number of sand blast and dust arrester installations, included in which is equipment for Metters, Ltd., Sydney, Australia. Numerous items of sand blast, tumbling mill and dust arrester equipment have been purchased from the W. W. Sly Mfg. Co., Cleveland, while the National Engineering Co., Chicago, has placed two sand mixers in Eastern plants. The Westinghouse Airbrake Co., Wilmerding, Pa., is about to distribute orders on several small cranes and hoists. A number of other crane lists are pending.

Slackening of Sales Appears General

BUYING of foundry equipment appears less active than a fortnight ago. One some lines such as sand cutters and sand-blast equipment, noted in arecent issue as having undergone a spurt in demand, buying again has fallen off, and with few exceptions there are no outstanding orders. New construction work, for which equipment would be required, is perhaps at as low an ebb as at anytime this year, barring possibly the first few weeks in January.

While reduced operations at the various jobbing foundries undoubtedly are accounting for some buying, that would not be noted otherwise at this time, the extent to which these reductions have been made in a number of quarters has created an atmosphere of pessimism, which precludes any buying that is not absolutely necessary.

While the Thatcher Furnace Co., Newark, N. J., recently suffered damage by fire, its foundry, it is understood, was in no way affected. The loss appears to be confined principally to its assembly shop, with some lighter damage in its storeroom. This resulted in some hurried orders for flasks and other supplies. Levering Bros., Brooklyn, recently closed on two 1-ton, single I-beam cranes for its foundry to the Chisholm-Moore Mfg. Co. The Continental Gin Co., Birmingham, Ala., is reported to be inquiring for two 15-ton and two 10-ton electric cranes and several 1-ton handpower cranes for a new foundry and machine shop. Prices on cranes continue easy, with the situation purely a buyer's market.

The W. W. Sly Mfg. Co., Cleveland, has sold tumbling mill equipment to Wm. Cramp & Sons Ship & Engine Building Co., Philadelphia and dust arrester equipment to the Abram Cox Stove Co., Philadelphia. The Pangborn Corp., Hagerstown, Md., has placed sand blast equipment with Clare Bros. & Co., Ltd., Preston, Ont. and the Norfolk & Western Railway Co., Roanoke, Va., and a dust arrester installation with the Knox Stove Works, Knoxville, Tenn. Included in the few new construction projects at this time is a $40,000 plant addition, 70 x 120 feet, for the Trenton Malleable Iron Co., Trenton, N. J. The general contract has been awarded to Joseph P. Drugan, of that city.

Restricted Buying Continues

WITH many foundries in Pittsburgh and vicinity going through an idle period, and with others on monthly operating schedules, purchases of foundry equipment are being withheld. However, from time to time, orders are placed as absolute needs arise and buying cannot be postponed. Several operators, which were prospective purchasers of large invoices of foundry equipment, have withdrawn their inquiries and give no indication as to when they will be reissued. With a number of inquiries before it for molding machines, the Herman Pneumatic Machine Co., Zelienople, Pa., reports that orders during the past week or so have been few and far between. The Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., has ordered another molding machine. Included in the list of foundries to be heard from with orders of this type of equipment is a new foundry at Jersey City, N. J., and several nearer by. Local sellers are at work upon an inquiry for an 8 x 8 x 12-foot core oven complete with racks, lift trucks, and oil burning equipment issued by an Ohio foundry. Somers, Fitler & Todd Co., Pittsburgh, received an order for a motor-driven pattern maker's lathe from the Braddock, Pa. board of education for a new trade school there, and other equipment was purchased from several other sellers.

The movement of small supplies has been greatly curtailed during the past week or two but dealers are optimistic concerning the future, expecting that in the fall business will develop in such a way as to make up for the present slackening. Several buyers have ordered individual flasks for trial and will purchase more as soon as the tests prove satisfactory; others have placed flask orders for as many as 50 at a time. Shovel orders are few and only an occasional riddle order is received. In the crane market the Westinghouse Airbrake Co., Wilmerding, Pa., is about to distribute orders for several small cranes and hoists. The Marion Steam Shovel Co., Marion, O., bought a 10-ton 3-motor, 75-foot 11-inch span crane from the Morgan Engineering Co., while a manufacturer at Dayton, O. closed on six cranes, two 5-ton electric and four 10-ton hand-power cranes with the Northern Engineering Works, Detroit. The Parkersburg Machine Co., Parkersburg, W. Va., still is to be heard from in connection with its inquiry for a 5-ton crane. The United States Radiator Co. will purchase a crane and other equipment for its new plant at Corry,

Pa. At least one crane will be purchased by the Westinghouse Electric & Mfg. Co. for its new plant at Mansfield, O., the structural shape award, 1200 tons, having been placed with the McClintic-Marshall Co., Pittsburgh, last week. This interest at Sharon is inquiring for a wall crane. The Atcheson, Topeka & Santa Fe railroad recently placed an order for 28 arc welding systems with the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. These will be distributed among 14 of the company's shops from Chicago to the Pacific Coast.

Chicago Business Slack

CHICAGO district manufacturers of foundry equipment are experiencing a dearth of real live inquiry. Foundries have been generous buyers of pig iron recently and have displayed increasing interest in the scrap market, but they hold aloof from considering new equipment. The National Engineering Co., Chicago, has placed sand mixers in the plants of the Waterbury Mfg. Co., Waterbury, Conn., and the Morris Machine Works, Baldwinsville, N. Y. The Belle City Malleable Iron Co., Racine, Wis., has a 10-ton material yard crane, some molding machines and a monorail system to place before its expansion program has been completed. Tumbling mill equipment has been sold to the Peoria Malleable Castings Co., Peoria, Ill., and the East St. Louis Castings Co., East St. Louis, Ill., by the W. W. Sly Mfg. Co., Cleveland.

Inquiries Fall Off

INQUIRIES for foundry equipment have declined slightly in volume during the past two weeks in the Cleveland territory. However, numerous inquiries have been pending for some time, including several for rather large installations, and builders of equipment anticipate action on these in the near future. Buying practically is at a standstill, users evidently waiting for some indication of a revival of business. The Kay-Brunner Steel Castings Co., Los Angeles, has purchased a tilted sandblast mill of the positive pressure type from the W. W. Sly Mfg. Co., Cleveland. That manufacturer has sold tumbling mill equipment to the Jarecki Mfg. Co., Erie, Pa., the Oklahoma Steel Castings Co., Tulsa, Okla., and the Acme-Palmers & De'Mooy Foundry Co., Cleveland, as well as dust arrester equipment to the Ford Motor Co. of Canada, Ford, Ont. The latter company also purchased spark arrester equipment. Cinder mill equipment has been sold to the Zanesville Malleable Co., Zanesville, O. A number of foundries which are practically shut down are having machines and other equipment gone over in preparation for increased activity. This business is materially assisting in keeping several builders busy. Equipment manufacturers expect an early betterment in the market.

New England Market Dull

TAKING the holiday as an excuse many New England foundries shut down for indefinite periods the first of the month, and as a result the already dull equipment market has suffered further reverses. A Massachusetts foundry is inquiring for a cupola for replacement purposes. The Rhode Island Malleable Iron Co., Hillsgrove, R. I., is taking bids on a foundry crane. Recent sales have been almost negligible. A Connecticut foundry bought a few molding machines and a manufacturer of hoists reports several scattered foundry sales. The Barstow Stove Co., Providence, R. I., has purchased tumbling mills from the W. W. Sly Mfg. Co., Cleveland. The Leonard & Baker Stove Co., Taunton, Mass., has secured dust arrester equipment from that company while the Gilbert & Barker Stove Co., Taunton, took an abrasive separator.

What the Foundries Are Doing

Activities of the Gray Iron, Malleable, Steel and Brass Shops

Draper Corp., Hopedale, Mass., operator of gray iron and brass foundries is taking bids for construction of a new boiler house, etc.

Pacific Faucet Mfg. Co., East Sixtieth street, Los Angeles, has completed plans through its engineers, Austin Co. of California, for a foundry.

Nanticoke Sash Weight Co., Scranton, Pa., has been incorporated with $5000 capital to manufacture sash weights, with J. W. Kirby as incorporator.

MacLean & Holt Co., St. John, N. B., are in the market for complete equipment for a molding shop and foundry. J. L. McAnty is purchasing agent.

Chicago Malleable Castings Co., West Pullman, Chicago, has installed a brake beam department for the manufacture of brake beams.

Davison-Namach Foundry Co., Deer Park, N. Y., has filed papers of dissolution.

The A. C. Foundry Co., Attalla, Ala., recently incorporated, has started construction of a plant for the manufacture of castings and various machine shop products. J. W. Alford and J. W. Carroll are associated with the project.

Mackintosh, Hemphill & Co., Twelth street, Pittsburgh, is in the market for grinding machinery and electrical tools for a foundry. The company operates gray iron, steel and brass foundries.

Doherty Mfg. Co., Ltd., Sarnia, Ont., manufacturer of stoves and operator of a gray iron foundry, plans constructing 150 x 400-foot plant for manufacture of furnaces, hot water heating equipment and electric stoves.

The Detroit Gray Iron Foundry Co., 6403 Wight street, Detroit, plans construction of a 2-story, 50 x 80-foot plant addition to its foundry on Iron street. Mildner & Eisen, 924 Hammond building, are architects.

Powell Brass Co., Grand Rapids, Mich., has been incorporated for $50,000 to manufacture and deal in plumbing fixtures, by William P. Powell, 1040 Bates street southeast, Clara A. Powell, and A. Phoebe Powell-Cowden.

Pacific Foundry Co., Tacoma, Wash., has taken up its operations at 1001 East D street, following the fire which damaged its plant at 1113 St. Paul avenue. A plant was constructed at the new address and modern equipment installed.

Charter Gas Engine Co., Sterling, Ill., is having plans prepared by Frank D. Chase, Inc., 720 North Michigan boulevard, Chicago, for a new gas engine plant, including machine shop, foundry and warehouse building to be constructed at Sterling.

Automotive Foundry Co., LaCrosse, Wis., is operating at capacity, and will take over the gray iron foundry of the former LaCrosse Tractor Co., to fill a large order recently received for parts of oil engines for a rum chaser fleet being built for the government.

Peck, Stow & Wilcox, Cleveland, has broken ground for a new plant to house its grinding department at its works in Southington, Conn. The company manufactures hardware and operates gray iron and brass foundries.

The Florida Machine & Foundry Co., Jacksonville, Fla., has been incorporated for $500,000 to manufacture castings, machine shop products, etc. Franklin G. Russell, 950 Riverside avenue, is president and O. M. Smith secretary.

Finished Die Castings Co., 2239 Herndon street, Chicago, has been incorporated with 100 shares no par value stock, to manufacture and deal in metal castings, with Maurice P. Geraghty, Robert J. Monahan and Samuel J. Laumbard as incorporators.

Fisher Governor Co., South First and East Linn streets, Marshalltown, Iowa, operator of machine shops and foundries, has awarded the general contract to Toppager Construction Co., Albert Lea, Minn., for a 2-story, 60 x 125-foot plant addition and alterations.

The Standard Sanitary Mfg. Co., Pittsburgh, which has outgrown its Milwaukee plant and warehouse at 311-5 Fifth street, will build a 3-story fireproof building, 80 x 175 feet on St. Paul avenue. F. E. Fowle is Milwaukee manager with offices at 426 Broadway.

United States Radiator Co., Detroit, has taken out permits for constructing a warehouse extension, 25 x 100 feet, 1-story, of concrete and steel construction; a machine shop, 165 x 175 feet, steel and concrete, and a 25 x 50-foot office building, at Corry, Pa.